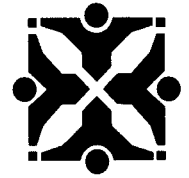


City of Columbia

701 East Broadway, Columbia, Missouri 65201



Agenda Item Number: REP 98-15

Department Source: Parks and Recreation

To: City Council

From: City Manager & Staff

Council Meeting Date: 10/5/2015

Re: 2015 Our Natural Legacy Implementation Actions Report

Documents Included With This Agenda Item

Council report

Supporting documentation includes: Our Natural Legacy Implementation Actions Report and Land Preservation Scoring Matrix: City of Columbia Parcel Scoring Report

Executive Summary

In December 2014, Council authorized the Parks & Recreation Department to enter into an agreement with the Greenbelt Land Trust for the implementation phase of the open space/green infrastructure plan known as "Our Natural Legacy: A plan for Columbia and Boone County." The 2015 report and Land Preservation Scoring Matrix is attached for Council consideration. In addition to conservation initiatives, the key deliverables for the City include the development of a Land Preservation Scoring Matrix; identifying seven land acquisition targets for the City; and evaluation of land that is offered to the City for either purchase, donation, or a combination of the two. Park staff will present a list of potential land acquisition options to the City Council during the next available Council Work Session tentatively scheduled for January 19, 2016. This is the second year of a three year plan, and staff will return to Council in November with a request to enter into an agreement with Greenbelt for the third year.

Discussion

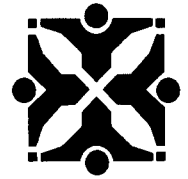
The City's FY-2014 capital improvement budget included \$50,000 in support for the implementation phase of the open space/green infrastructure plan known as "Our Natural Legacy: A plan for Columbia and Boone County (ONL)." This multi-agency public/private partnership plan accomplished numerous conservation goals, including: developed a comprehensive natural resource inventory; identified ways to connect people to nature; discussed health benefits of green infrastructure; created a vision on how to support rural/urban farming; and identified notable historic, cultural and scenic resources.

The implementation phase of this plan included three partners: Greenbelt Land Trust, Missouri Department of Conservation and the City of Columbia. These partners contributed up to \$50,000 each towards a fund that Greenbelt used to hire a Land Conservation Coordinator to carry out the following initiatives of the ONL plan:

1. Establish a Land Conservation Implementation Committee.
2. Work with various partners, develop approaches to deliver land conservation within all or parts of

City of Columbia

701 East Broadway, Columbia, Missouri 65201



the Missouri River Conservation Priority Area, City of Columbia Conservation Priority Area, Bonne Femme Conservation Priority Area, and the Cedar Creek Priority Conservation Areas.

3. Develop a Land Preservation Scoring Matrix, which will be used to identify land acquisition targets for the City of Columbia's Parks & Recreation Department.
4. Recommend and prioritize seven land acquisition targets for the City of Columbia's Parks & Recreation Department in harmony with the mission and vision statement of the City and Department.
5. Evaluate properties offered to the City by a willing seller using the Land Preservation Scoring Matrix.

The agreement period was from December 16, 2014 to September 30, 2015.

Greenbelt Land Trust staff and volunteers completed all deliverables as outlined in the agreement.

Fiscal Impact

Short-Term Impact: No fiscal impact to accepting this report.

Long-Term Impact: No fiscal impact to accepting this report.

Vision, Strategic & Comprehensive Plan Impact

Vision Impact: Environment, Parks, Recreation and Greenways

Strategic Plan Impact: Social Equity...Improving the Odds for Success, Infrastructure...Connecting the Community

Comprehensive Plan Impact: Environmental Management

Suggested Council Action

For information only. Staff will return to Council during a closed work session to discuss land acquisition options.

Legislative History

December 1, 2014: Agreement with Greenbelt Land Trust of Mid-Missouri for implementation phase of "Our Natural Legacy Plan"

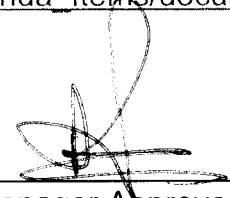
<http://www.gocolumbiamo.com/Council/Commissions/downloadfile.php?id=15942>

October 15, 2012: Agreement with Greenbelt Land Trust of Mid-Missouri to develop an open space/green infrastructure plan.

http://www.gocolumbiamo.com/ParksandRec/Council_Agenda_Items/documents/council_2012_10_01_greenbelt.pdf



Department Approved



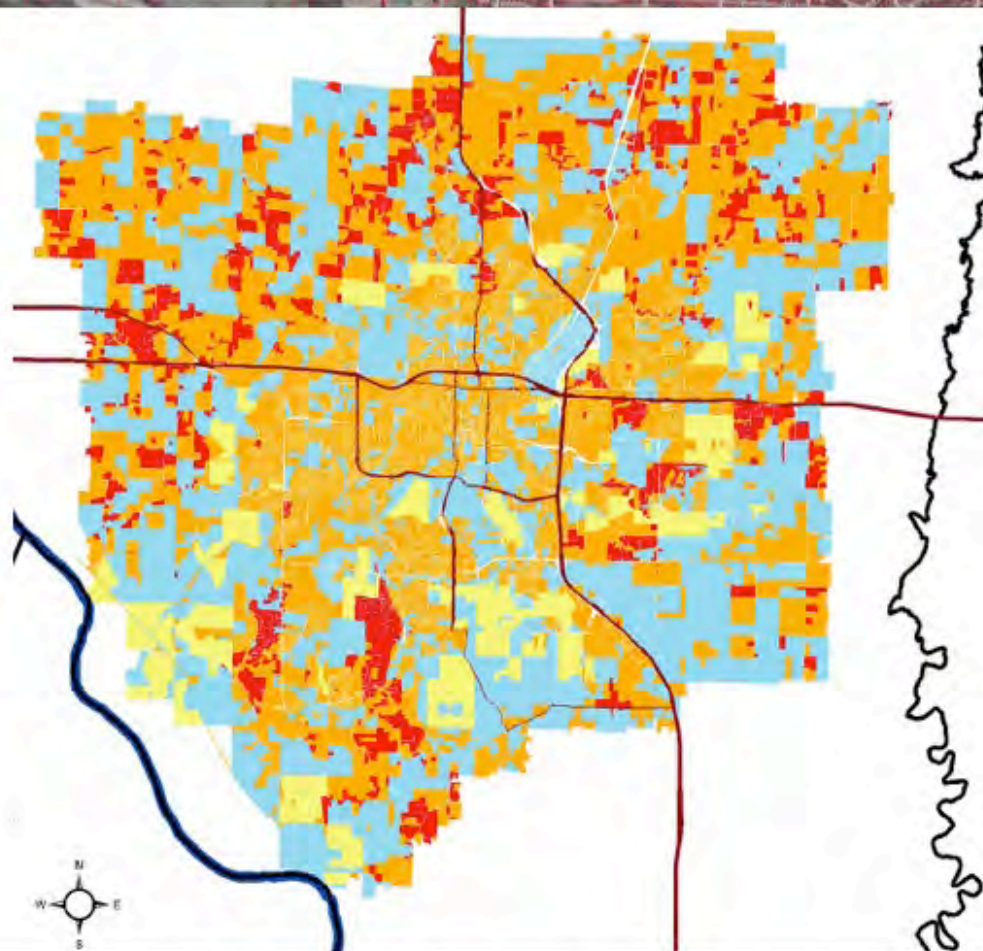
City Manager Approved



SUPPORTING DOCUMENTS INCLUDED WITH THIS AGENDA ITEM ARE AS FOLLOWS:

Our Natural Legacy Implementation Actions Report and
Land Preservation Scoring Matrix: City of Columbia Parcel Scoring Report

LAND PRESERVATION SCORING MATRIX: CITY OF COLUMBIA PARCEL SCORING REPORT



*Part of the Partnership Project to Further Implementation of
Our Natural Legacy: A Plan for Columbia and Boone County*

July 30, 2015

Prepared for the
Parks and Recreation Department, City of Columbia, MO
by

Greenbelt Land Trust of Mid-Missouri



ACKNOWLEDGEMENTS

This report is provided under the auspice of the Board of Directors, Greenbelt Land Trust of Mid-Missouri (GLT). Mike Powell (GLT Land Conservation Coordinator) and Gene Gardner (GLT President) drafted the report. We wish to especially acknowledge the GIS expertise and professional contributions of Elizabeth Cook (GLT volunteer), whose GIS knowledge and skills made development and applications of the GIS model possible. We also greatly appreciate Mike Griggs (City of Columbia) for his communications and coordination that made this project possible. Mike Snyder and Ryan Atkinson (City of Columbia) also contributed GIS data and technical advice used during model development and applications. We also wish to thank Tom Schauwecker and Jeff Davis (Boone County Assessor's Office) for providing the parcel polygon layer for the City of Columbia metro area through a Limited License Agreement. We are especially grateful for the vision, time and commitment of the members of the Land Conservation Implementation Committee (LandCIC) who, over the course of the last seven months, worked collaboratively to develop the Land Preservation Scoring Matrix; specially, we wish to acknowledge Susan Troxel-Dewitt and John George (Missouri Department of Conservation) for their consistent involvement.

□ This report presents the findings, to date, of an on-going partnership effort between the City of Columbia Parks and Recreation Department, Boone County, Missouri Department of Conservation, U.S. Fish & Wildlife Service, and Greenbelt Land Trust of Mid-Missouri (GLT). Specifically, the data contained in this report fulfills GLT's contractual obligations as stipulated in part C. 5., 6. and 7. in the Cooperative Agreement between the City and GLT, dated December 4, 2014.

INTRODUCTION

In December 2014, the City of Columbia and Greenbelt entered into an agreement to implement a mutually beneficial framework for conservation action in specific areas of the City of Columbia and Boone County. In March 2015, the Forestry Division of the Missouri Department of Conservation provided additional support for this effort through a Cooperative Agreement. The Boone County Commission contributed GIS data for the purpose of this project.

Early in 2015, the Greenbelt Land Trust of Mid-Missouri (GLT) established a Land Conservation Implementation Committee (LandCIC), with a major goal of identifying priority actions to achieve progress for land and water conservation in Boone County, connecting people to nature, and helping develop previously-planned outdoor recreation facilities (i.e., trails and parks). One specific objective of the LandCIC included development of a “Land Preservation Scoring Matrix” that could aid in implementation of the land acquisition priorities identified in the City of Columbia Parks and Recreation Department’s 2013 Parks, Recreation, and Open Space Plan (2013 PROSMP). This collaborative partnership project resulted in partnering agencies and entities working closely together to deliver land conservation actions within the highest priority areas identified in the Our Natural Legacy Implementation Actions Report (May 29, 2015).

We used the best science and data available, combined with GIS analysis, to assign numerical scores to parcels in an attempt to indicate their “importance” according to the standards developed in the Land Preservation Scoring Matrix (refer to Public Land Acquisition Scoring Matrix and Report, May 27, 2015), which was designed to implement the priorities identified in the City of Columbia Parks and Recreation strategic plan (2013 PROSMP). Initially, the City of Columbia requested that GLT examine ten properties (13 parcels) and complete the scoring process using the matrix and other resources available. The resulting scores for these parcels are summarized in Table 2 later in this report, and the completed forms are included as attachments to this report (Appendix B) as examples of how the scoring matrix can be applied to indicate acquisition priorities.

APPLIED MATRIX METHODOLOGY

For the sake of objectivity, efficiency, and analysis, we sought to use GIS analyses to score parcels according to the Scoring Matrix. However, not all scoring categories could be expressed in geospatial terms compatible with GIS analysis, and we did not, at the time of analysis, possess data to support analysis in other categories. Table 1, on the following page, identifies the categories scored using GIS analysis in this effort, categories that could be scored using GIS with additional data sets, and categories that cannot be scored using GIS analysis. Spatially explicit data were available for nine of the 24 factors defined in the scoring matrix. A general description of the nine factors used in the GIS model develop is provided in a following section.

Using ESRI's ArcGIS software, we developed a model where each parcel would accumulate points based on their intersection with selected factors (i.e., GIS "layers," such as trails, parks, public lands, streams, at-risk species locations, etc.) identified in the May 27, 2015, Public Land Acquisition Scoring Matrix and Report. Each of these layers were assigned a rule set – for example, a parcel received a point if an at-risk species location intersects it, it receives a point if it adjoins public land, or it receives a point if the parcel intersects a stream. This methodology was used to calculate scores for all categories that could be reasonably implemented using GIS analysis. The parcel polygon layer for the City of Columbia metro area that was provided by the Boone County Assessor's Office contained 49,104 parcels (Figure 1), which were all scored for the 43 points that could be scored using GIS analysis (of 100 total in the matrix).

Table 1. Factors defined in the Scoring Matrix in relation to their applicability for use in the GIS model.

| Scoring Category | GIS Scoring | Non-GIS Scoring | Potential GIS Scoring (with Additional Data) |
|--|-------------|-----------------|--|
| GENERAL FACTORS | | | |
| Waterway Buffer | X | | |
| Public Access | | X | |
| Zoning | | X | X |
| Acquisition Costs | | X | |
| Development Pressure | | X | X |
| Historic/Cultural Preservation | | X | X |
| Environmental Hazard | | X | X |
| Other Public Benefit | | X | |
| NATURAL RESOURCES | | | |
| Quality of Habitat | | X | X |
| At-risk Species | X | | |
| Underrepresented Natural Features | | X | |
| Scenic Value | | X | |
| Proximity to Protected Land | X | | |
| NEIGHBORHOOD PARKS | | | |
| Strategic Plan | X | | |
| COMMUNITY OR REGIONAL PARK | | | |
| Size | X | | |
| Recreational Facilities and Infrastructure | | X | |
| Location | X | | |
| SPECIAL PURPOSE PARKS | | | |
| Special Purpose | | X | |
| TRAILS | | | |
| Master Plan Priority | X | | |
| 30-Mile Loop Trail | X | | |
| Existing Interest | | X | X |
| Connectivity | | X | |
| Trail Length | X | | |
| Bridge Detractor | | X | |

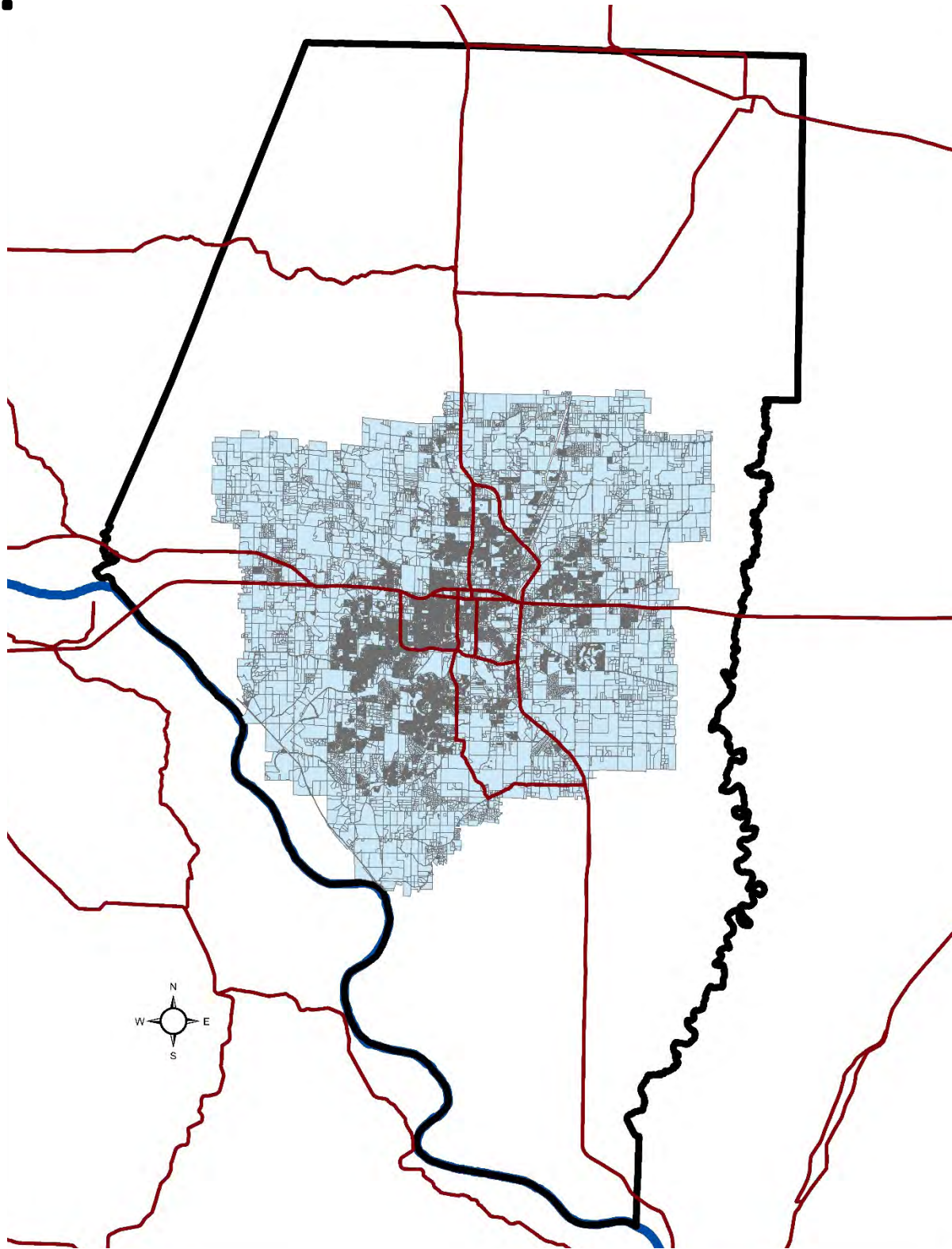


Figure 1. Location of the 49,104 parcels in Boone County (Source: Boone County Assessor's Office).

GIS Methodology by Scoring Category

Waterway Buffer Scoring Factor

According to the Definitions in Sec. 12A-233 in the Charter and General Ordinances of the City of Columbia, Missouri (Effective: October 7, 1985), a stream “Buffer” means a vegetated area including trees, shrubs, managed lawn areas, and herbaceous vegetation which exists or is established to protect a stream system, lake or reservoir. Scoring for this factor was based on the assumption that the greater amount of shoreline protected in a parcel, the more positive affect it will have on maintaining good water quality. Additionally, protection of both sides of the waterway provides greater water quality affects than protection of only one side. This analysis proved to be very challenging, primarily due to mapping errors and inconsistencies. In many cases, it is obvious that a stream was probably intended (or was actually used during a land survey) to form the parcel boundary. However, the “line work” for the stream layer seldom fit well with the parcel layer boundary – this is what we referred to as mapping errors and inconsistency. Also, there are “voids” in the parcel layer which are created by roadways and other anomalies; this presented another challenge to this analysis of streams. As a result, if a simple intersect function between parcel and stream was performed, those parcels that actually do NOT touch the stream “line” would be excluded from receiving a score (even though on the ground they actually border the stream) and the “voids” created even more problems. So to alleviate these errors, the streams were broken into segments within each parcel they extended through and were buffered by a distance of 50 ft. This resulted in a “waterway buffer polygon” that could potentially intersect with a parcel that was adjacent to the stream, but that did not actually touch the “line work” due to mapping errors. This allowed a score to be assigned to a parcel, as determined by the area (sq. ft.) of the waterway buffer that it contained.

During spatial development of this factor for use in the GIS scoring model, only Tier I Core Stream Segments (identified as priorities for conservation actions in the Our Natural Legacy Implementation Actions Report 2015), were used to assign scores to parcels. However, even these Tier I segments should be examined further on-site to determine if their ecosystem functions are actually intact; those in need of restoration should become the highest priority areas for conservation actions. The Tier II stream segments identified in the 2015 ONL report as in need of restoration were not used in this GIS model analysis. However, where these segments are contiguous with or connected to intact Tier I stream segments, future efforts should include an evaluation of their restoration feasibility.

At-risk Species

Through a Memorandum of Understanding, the Missouri Department of Conservation (MDC) provided GLT their Missouri Natural Heritage Program (MONHP) data in the form of a GIS layer. Specifically, MONHP data related to the identification and distribution of Missouri species and communities of conservation concern buffered to one-quarter (1/4) mile and included species name for Boone County, Missouri. A total of 61 at-risk species are known from Boone County, including 23 plants, nine invertebrates, 14 fish, eight birds, and seven mammals. Six of these species are classified as federally-endangered or –threatened and two additional species (both fish) are ranked as State Endangered. Additionally, there are natural community types found in nine locations in Boone County that are considered imperiled or vulnerable, most of which are evidently not currently receiving adequate protection or management. The at-risk

species data are “administratively confidential” and are merely loaned to GLT for use in this GIS scoring model application. Because of the propriety of the MONHP data, GLT will not reproduce, distribute nor release any information from the MONHP in any format or spatial resolution, by use of the internet or any other form of disclosure or release. Therefore, only a score was assigned to a parcel during the model application and no information related to the MONHP data were associated with the parcel attribute table. For a score of 7 (i.e., observed at-risk species on site) the buffered polygons for all records of the 61 species of plants and animals were used, but where scores were dependent upon distances, only animal species were used for the application (based on the assumption that plants are not seasonally mobile). Parcels that received scores of seven (i.e., on-site records) and were also within distance factors were accorded the highest possible score and scores were not cumulative.

Proximity to Protected Land

During the GIS scoring model application, “Protected Land” was defined as all public lands owned/managed by state and federal agencies and all City of Columbia recreation facilities (e.g., parks and trails). Parcels received a score of four if the parcel boundary was shared with the protected land. For scores based on distances, a centroid was created for each protected land polygon and the distances were buffered from that centroid; the boundary of the parcel that occurred inside this buffered area were assigned the appropriate score.

Strategic Plan (Neighborhood Parks)

A GIS shapefile for primary, secondary and tertiary acquisition targets was provided by the City of Columbia Parks and Recreation GIS staff. These polygons appear in the 2013 Parks, Recreation and Open Space Master Plan (2013 PROSMP). The GIS model application used a straightforward intersect application to determine parcel scores.

Community or Regional Parks

A GIS shapefile for community and regional parks acquisition targets was provided by the City of Columbia Parks and Recreation GIS staff. These polygons appear in the 2013 Parks, Recreation and Open Space Master Plan (2013 PROSMP). However, size of the parcel was an important factor in assigning its score. Also, distances from one Community park to another and the distance from one Regional park to another were also used to score parcels. For scores based on distances, a centroid was created for each existing Community and Regional park and a buffer polygon created for each of the respective distances; the boundary of the parcel of an appropriate size that occurred outside these buffered areas was assigned the corresponding score.

Trails

A GIS shapefile for existing and planned trails, ranked according to acquisition priority, was provided by the City of Columbia Parks and Recreation GIS staff. These planned trail systems (e.g., 30-mile Loop Trail), individual trail segments, and connectors are discussed in more detail in the 2013 Parks, Recreation and Open Space Master Plan (2013 PROSMP). Parcels that intersected the lines of proposed trails were assigned points according to what priority they were given in the 2013 PROSMP.

IMPLEMENTATION ACTIONS – NEXT STEPS

In addition, GLT will apply an identical scoring process for any parcels offered to the City of Columbia through the effective date of the Cooperative Agreement (September 30, 2015). However, we have identified some additional objectives for improved analysis that could be accomplished through an extension of this collaborative project between the City of Columbia, GLT, and their land conservation partners. This section outlines some of those possible next steps.

- A. The May 29, 2015 Our Natural Legacy Implementation Actions Report identifies the 104,572-acre City of Columbia Conservation Priority Area (CPA) encompassing the current city limits and much of the area outside of Columbia that will be developed in future years. That report identifies two primary actions for that area:
 - a. Promote land conservation efforts and existing outdoor amenities to the citizens and visitors to the City of Columbia, with a particular emphasis on their value in an urban environment; and
 - b. Partner with land management agencies and research funding sources for development of an urban wildlife and habitat management plan to provide guidelines for integrating natural and human systems in Columbia's parks and open spaces.
- B. Conservation of tree resources in the City of Columbia CPA could be more effectively coordinated. MDC's "Trees Work" Campaign and the Columbia Urban Tree Task Force could be integrated with the future City Tree Board to formulate and establish urban tree canopy increase goals. Where riparian corridors exist, GLT could assist the City and agency partners in encouraging property owners along streams to improve compliance with Columbia City Ordinance § 12A-236. - Design standards for stream buffers. GLT can conduct additional GIS analyses to identify those segments of Tier I Core Streams and Tier II streams in need of restoration and initiate a campaign to establish appropriate vegetation types in the highest priority segments to improve stormwater management and water quality. GLT is also working with MDC, MDNR and USFWS to promote establishment of native vegetation to improve urban and aquatic wildlife habitat conservation.
- C. With further refinement, the GIS methodology in this report could be expanded to support a proactive approach by the City of Columbia's Parks and Recreation Department. For example, added data could support analysis including factors such as:
 - a. areas of significant hydrology or geology
 - b. unique examples of biological communities
 - c. areas of cultural or historical significance
 - d. land that protects stream corridors

Through the acquisition or development of additional GIS spatial data, GLT could continue to work with the City of Columbia to identify areas that meet the above criteria. This would be a proactive approach to identify areas for acquisition (or conservation easement) that are not based

on specific lots or parcels, but are identified as areas of need, which could provide approximate locations for future parks. This allows for reasonable negotiations to occur between the City and property owners, something that GLT could also assist with. In the 2013 PROSMP, the Columbia Parks and Recreation Department proposes that additional Natural Resource Areas should be acquired within the next 10 – 20 years. However, the City has not developed any recommended acquisition areas for Natural Resource Areas. Such lands should be aside for conservation of significant natural resources, remnant landscapes, open space, buffering of waterways and roadways, and for aesthetic reasons. The City has defined a need for these areas as habitat for wildlife (e.g., natural drainage-ways, creeks, wetland, and significant stands of native veg.) and to increase the potential for wildlife viewing opportunities and enjoyment by its citizens.

GLT's collaboration with the City of Columbia and other conservation stakeholders could also pay dividends for Columbia and Boone County in areas not related to GIS analysis. Cooperation for greater impact should be a continued goal for the betterment of our community.

APPENDIX A: EVALUATION FORM

LAND ACQUISITION SCORING EVALUATION FORM
Parks and Recreation Department, City of Columbia, Missouri

Parcel No(s): _____ Property Address: _____

Parcel Size (acres): _____ For Sale (Yes/No): _____ Cost: \$ _____

Evaluator(s): _____ Date: _____

Part 1: Scoring Matrix

| Scoring Category* | Parcel Score – GIS Model | Parcel Score – Interpretation |
|---|--------------------------|-------------------------------|
| General Factors | | |
| Waterway Buffer | | |
| Public Access (see Part 2, A1) | | |
| Zoning | | |
| Acquisition Cost | | |
| Development Pressure (see Part 2, A2) | | |
| Historic/Cultural Preservation (see Part 2, A3) | | |
| Environmental Hazard (see Part 2, A4) | | |
| Other Public Benefits (see Part 2, A5) | | |
| Subtotal | | |
| Natural Resources Factors | | |
| Quality of Habitat (see Part 2, B1) | | |
| At-risk Species | | |
| Under-represented Natural Features (see Part 2, B2) | | |
| Scenic Value (see Part 2, B3) | | |
| Proximity to Protected Land (see Part 2, B4) | | |
| Subtotal | | |
| Neighborhood Parks | | |
| Strategic Plan Priority | | |
| Subtotal | | |
| Community or Regional Parks | | |
| Size | | |
| Recreational Facilities and Infrastructure (see Part 2, D1) | | |
| Location | | |
| Subtotal | | |
| Special Purpose Parks | | |
| Special Purposes (see Part 2, E1) | | |
| Subtotal | | |
| Trails | | |
| Master Plan Priority | | |
| 30-Mile Loop Trail | | |
| Existing Interests | | |
| Connectivity (see Part 2, F1) | | |
| Trail Length (see Part 2, F2) | | |
| Bridge Detractor (see Part 2, F3) | | |
| Subtotal | | |
| Total Each Column | | |
| Cumulative Total Score (add both columns) | | |
| *Refer to back of this page for key to point scores Greyed-out blocks indicate scoring method not used | | |

LAND ACQUISITION SCORING EVALUATION FORM
Parks and Recreation Department, City of Columbia, Missouri

Key to Assigning Points to Parcels

[see Public Land Acquisition Scoring Matrix and Report, May 27, 2015, for detailed descriptions of each factor]

General Factors

Waterway Buffer: amount of shoreline protected; 7=>0.5 mi. (>66,000 sq. ft.); 5=>0.25 mi. but <0.5 mi. (>33,000 - <66,000 sq. ft.); 3=>0 but <0.25 mi. (>0 - <33,000 sq. ft.); 0=0

Public Access: is public access feasible; 2=yes; 0=no

Zoning: is zoning compatible with intended use: 2=yes; 0=would require zoning variance

Acquisition Cost: 6=donation or no cost; 5=partial donation; 3=cost sharing; 1=fair market value; 0=not for sale

Development Pressure: 5=imminent threat; 3=possible threat; 0=no known threat

Historic/Cultural Preservation: 5=significant features known; 0=no known significant features

Environmental Hazard: 0=no known risks; minus 5=potential or known minor risks; minus 10=major hazard known requiring remediation

Other Public Benefits: 1-3=add 1 for each additional public benefit, max. of 3

Natural Resources Factors

Quality of Habitat: 7=restored or undisturbed native habitat, few to no invasive spp.; 4=some restoration needed, significant invasive spp. control needed; 0=complete restoration required

At-risk Species: 7=observed on-site; 5=habitat present, spp. observed within 0.5 mi.; 3=habitat present, no record of nearby sightings; 0=no apparent benefit

Under-represented Natural Features: 7=natural features of note; 0=widely conserved natural features in Boone Co.

Scenic Value: 5=sig. scenic features visible; 3=sig. scenic features not visible; 0=none present

Proximity to Protected Land: 4=adjacent to protected land; 3=protected land within 0.25 mi.; 2=protected land within 0.5 mi.; 0=no protected land in proximity

Neighborhood Parks

Strategic Plan Priority: acquisition priority ranking; 10=primary area; 7=secondary area; 4=tertiary area; 0=no priority

Community or Regional Parks

Parcel Size: 6=>200 ac.; 5=70-200 ac.; 3=40-70 ac.; 1=15-40 ac.; 0=>15 ac.

Recreational Facilities and Infrastructure: are they present; 3=existing, usable; 2=requires minor repair or improvement; 1=lacking; 0=not feasible; minus 1=represent nuisance or excessive costs

Location: 1=regional park >5 mi. from another regional park or community park >3 mi. from another community park; 0=distance less than above

Special Purpose Parks

Special Purposes Fulfilled: 10=fulfills purpose not fulfilled by other parks; 5=fulfills similar purpose to existing special purpose park; 0=does not fulfill special purpose

Trails

Master Plan Priority: acquisition priority ranking; 3=primary; 2=secondary; 1=tertiary; 0=no priority

30-Mile Loop Trail: contribution to completion; 2=contributes; 0=no contribution

Existing Interests: 1=trail would utilize existing legal interest; 0=no existing interest

Connectivity: 1=provides connectivity; 0=does not provide connectivity

Trail Length: 3=would provide \geq 0.5 mi.(2,640 ft.) of trail; 2=between 500 – 2,640 ft.; 1=<500 ft.; 0=none

Bridge Detractor: 0=no bridge requirements; minus 1=for each bridge required

LAND ACQUISITION SCORING EVALUATION FORM
Parks and Recreation Department, City of Columbia, Missouri

Part 2: Additional Information

Waterway Name (if known): _____ Restoration Priority: _____

A1. Description of Potential Public Access:

A2. Development Pressure:

A3. Description of Historic/Cultural Features:

A4. Known/Potential Environmental Hazards:

A5. Justification for Other Public Benefits:

B1. Description of Habitat/Vegetation:

B2. Under-represented Natural Features:

B3. Description of Scenic Feature(s):

B4. Name of Protected Land in Proximity (if applies):

D1. Description of Existing Recreational Facilities and Infrastructure (e.g., buildings if present):

E1. Special Purpose:

(Continued on back)

LAND ACQUISITION SCORING EVALUATION FORM
Parks and Recreation Department, City of Columbia, Missouri

Additional Information (cont.)

F1. Description of Existing Interests (e.g., easement):

F2. Priority Acquisition for Trail Connectivity [name of trail(s) if applies]:

F3. Bridge Detractor (if required, approximate length and number):



Our Natural Legacy Implementation Actions Report

May 29, 2015

Authors:

Mike Powell

Land Conservation Coordinator, Greenbelt Land Trust of Mid-Missouri

Gene Gardner

President, Greenbelt Land Trust of Mid-Missouri

I. Introduction

The Our Natural Legacy (ONL) plan is built on the concept of collective impact, which “occurs when organizations from different sectors agree to work from a common agenda, align their efforts, and use shared measurement systems.”¹ Collective impact is built on the simple idea that “large scale change occurs best by pulling together a larger system of organizations around a problem or theme, in this case nature.”² Put another way: collective impact is the idea that a group of cooperating organizations can do more good than the sum of its parts.

Goal 5.2 of the City of Columbia’s Vision Plan states that “Land will be preserved throughout Columbia and Boone County to protect farmland, scenic views, natural topographies, rural atmosphere, watersheds, healthy streams, natural areas, native species, and unique environmentally sensitive areas, thereby enhancing quality of life.” Other elements of our common vision state that “Columbia and its neighboring communities will be a place where the air, water, land, and natural aesthetic qualities of our environment shall be protected by a combination of conservation strategies including, but not limited to, regulations and ordinances, conservation incentives, education programs, and smart growth planning.” Our combined strategies to meet these visions include conserving open space, farmland, natural beauty, and critical environmental areas, as well as evaluating potential land conservation areas in Columbia and Boone County.

The Mission of the Missouri Department of Conservation is “To protect and manage the fish, forest, and wildlife resources of the state; to serve the public and facilitate their participation in resource management activities; and to provide opportunity for all citizens to use, enjoy, and learn about fish, forest, and wildlife resources.” An MDC vision statement seeks to have healthy, sustainable plant and animal communities throughout the state of Missouri for future generations to use and enjoy, and to have fish, forest and wildlife resources in appreciably better condition than they are today. Other elements of that vision include having all Missourians understand the relationship and value of plant and animal communities to our social and economic well being, and to have citizens and government agencies work together to protect, sustain, enhance, restore or create sustainable plant and animal communities of local, state, and national significance. Greenbelt wholeheartedly supports the conservation of natural resources in Missouri; that is why Greenbelt and MDC are working together to develop, implement, promote, and facilitate efforts and activities designed to benefit the fish, forest, and wildlife resources of Missouri.

In 2012, the Greenbelt Land Trust of Mid-Missouri (Greenbelt) established a collaborative Advisory Committee composed of 18 agencies, non-governmental organizations, and private citizens, charged with the task of developing a green infrastructure plan. That plan was later formalized as Our Natural Legacy: A Plan for Columbia and Boone County (ONL). This partnership planning effort, led by Greenbelt through a contract with Community Initiatives, was in support of Goal 5.2 of the City’s Vision Plan. Identified strategies under this goal include the need to evaluate land

¹ *Our Natural Legacy: A Plan for Columbia and Boone County*, page 3.

² *Id.*

conservation areas in Columbia and Boone County and to develop funding mechanisms to finance conservation of those areas.

This collaboration incubated a number of initiatives, called “components.” The process also created two products: 1) the ONL document (available for download at www.greenbeltmissouri.org) and 2) more technical reports, like this one, that included geospatial, cultural, and economic analyses that are intended to help prioritize lands that could be protected as Natural Resource Areas, developed into recreational facilities such as parks and trails that would be acquired through fee simple acquisition, or protected under private ownership using conservation easements. Some of the seven components of the ONL have already materialized as a result of continued collaborative partnerships, but some will take more work, leadership, and significant funding to accomplish. Agency representatives and community leaders of Columbia and Boone County plan to continue their work on several of the unrealized components.

In December 2014, the City of Columbia and Greenbelt entered into an agreement to implement a mutually beneficial framework for conservation action in specific areas of the City of Columbia and Boone County. In March 2015, the Forestry Division of the Missouri Department of Conservation provided additional support for this effort through a Cooperative Agreement. The Boone County Commission contributed GIS data for the purpose of this project. This continued support builds upon the foundation of strong partnerships, revitalizing the Green Infrastructure Network development process. This newer, more specific effort is geared to 1) implement land conservation measures in the highest priority areas, and 2) assist the City in efforts to improve our community’s health, stability, beauty, and quality of life, by providing outstanding parks, trails, recreational facilities, and leisure opportunities for all Columbia citizens.

Early in 2015, Greenbelt established a Land Conservation Implementation Committee (LandCIC; Table 1, following page), and extended invitations to all 18+ members of the former ONL Advisory Committee to participate in the implementation of the ONL plan. In general, the goal of the LandCIC is to identify priority actions to achieve progress for land and water conservation, connecting people to nature, and helping develop previously-planned outdoor recreation facilities (i.e., trails and parks). The more specific objectives of the LandCIC include:

- Develop a “Land Acquisition Scoring Matrix” that will be used to identify land acquisition priorities (minimum of top seven priorities) for the City of Columbia’s Parks & Recreation Department;
- Work closely with partners to deliver land conservation actions within ONL Conservation Priority Areas (i.e., focus areas);
- Use the best science and data available, combined with GIS applications, as decision-making tools to guide the development of implementation actions;
- Recognize and prioritize recommended land and water conservation actions in harmony with the missions of the LandCIC member agencies and entities.

| Entity | Representative |
|---|--|
| Greenbelt Land Trust of Mid-Missouri | Mike Powell, Gene Gardner, Esther Stroh |
| City of Columbia, Parks and Recreation Department | Mike Griggs, Mike Snyder, Gabe Huffington |
| Missouri Department of Conservation | John George (Wildlife Div.) Susan Troxel-DeWitt (Forestry Div.) Ann Koenig (Forestry Div.) |
| Missouri Department of Natural Resources | Joe Engeln |
| Boone County | Bill Florea & Uriah Mach |
| Columbia Public Schools | Jake Giessman |
| U.S. Fish & Wildlife Service, Ecological Services Office | Amy Salveter, *Shauna Marquardt, John Weber |
| U.S. Fish & Wildlife Service, Big Muddy National Fish & Wildlife Refuge | Tom Bell |
| Ozark Regional Land Trust | Peggy Horner |
| Sustainable Farms & Communities, Inc. (i.e., Columbia Farmer's Market) | Ken Pigg |
| Missouri River Relief | Jeff Barrow |
| PedNet Coalition | Annette Triplette |
| Conservation Federation of Missouri | Rehan Nana |
| Table 1. Agencies and non-governmental organizations that participated in the Land Conservation Implementation Committee after receiving invitations that were extended to all members of the former ONL Advisory Committee. | |

II. Defining Our Natural Legacy

As stated by the U.S. Fish and Wildlife Service, public lands, including our national forests, federal grazing lands, and a myriad of sites owned by state and local governments, are among the nation's most treasured assets. However, few environmental goals can be achieved without engaging as partners those many landowners who grow crops, manage forests, raise livestock, and otherwise use and enjoy the resources of privately owned lands. Engaging the nation's private landowners is one of the most important challenges facing conservation today. To meet that challenge, landowners need incentives that reward them for protecting wildlife, restoring habitats, safeguarding watersheds, and enhancing other environmental assets.

Eight species of birds (all which are considered imperiled or vulnerable) and 56 other species of plants and animals are considered species of conservation concern by the Missouri Department of Conservation (Missouri Species and Communities of Conservation Concern Checklist 2015). According to the Association of Fish and Wildlife Agencies, State of the Birds Report 2013 - Private Lands,

">60% of the land area in the US is privately owned and more than 100 bird species have >50% of their U.S. breeding distribution on these private lands. However, as birds and other imperiled species reliant on habitats on private lands continue to decline, conserving private lands is complicated by both individual and institutional barriers."

Land trusts do not have the institutional barriers or bias that comes from "the government" trying to institute government-led programs on private lands. Land Trusts work with private landowners in ways that save the landowners money, while allowing them to live on their lands, farm the lands, and harvest fish, forest and wildlife in a responsible manner.

Johnny Morris (CEO of Bass Pro Shops) said "Conservation means balancing the sustainability of fish and wildlife with the many needs of humans for clean air and water; land; food and fiber; dependable energy; economic development and recreation." He also commented about that lack of dedicated funding for fish and wildlife, saying, "there has always been a significant gap in dedicated funding for conserving the 95 percent of all species that are neither hunted nor fished." Local land trusts and their partners support private wildlife habitat conservation using tax incentives for private landowners who conserve their property with conservation easements and other stewardship tools.

From 2005-2010, the >1,700 state, local and national land trusts in the U.S. have more than doubled the number of conserved acres to 47 million acres – an area representing 90% of the amount of land currently protected by National Parks. More than 93% of Missouri land is in private ownership, and conserving the natural resources on this majority of lands in Missouri cannot be accomplished through state or federal resource protection programs alone. Greenbelt works with private landowners to conserve fish, forest and wildlife resources on private lands that provide habitat.

Maximizing the human benefit of these natural resources requires that humans interact with them directly, and to facilitate that, public parks and trails are necessary. Columbia, as previously noted, has an extraordinary system of parks and trails. Why, then, does Columbia need more? The simple answer is that Columbia is a growing community, and the City of Columbia Parks and Recreation Department's ratio of park land acreage to citizens must similarly grow to keep pace and continue to meet the needs of citizens (determined through citizen input). With more than 57 miles of trails already in Columbia's trail system, Columbia offers a wide variety of community fitness and nature trails for walking, jogging, and biking. These trails connect neighborhoods, community parks, greenbelts, and natural areas across the city and county, thereby encouraging active, healthy lifestyles. According to 89% of the Columbia citizens that responded to the City's local surveys, living near a trail increased their overall quality of life. Columbia certainly lives up to Missouri's distinction as American Trails magazine's Best Trail State, but must keep working to continue to do so.

Trail development contributes to Columbia's economy and its citizens' well being. Nationwide, a number of studies have generally shown that trails had a positive impact on property values and either improved or had no impact on residents' quality of life. Therefore, Columbia Parks and Recreation Department and Parks, Recreation and Tourism Department (University of Missouri) conducted a survey of 149 property owners living within 200 yards of the MKT Trail.³ Responding residents owned or occupied the property near the MKT Trail for an average of 18 years. They use the trail mostly for health and exercise and most used the trail on a weekly basis. Property owners were satisfied living adjacent to the MKT Trail, and indicated the trail had improved their quality of life. A majority of respondents would choose to live near a trail again if they were to move. Most MKT neighbors responded that the trail makes their property more desirable and valuable if listed for sale. Overall, respondents ranked potential benefits of living near the MKT Trail very high and ranked potential problems of living next to the trail relatively low.

Trails are indeed a valued resource in Columbia's community. Good trail planning and development has enhanced the quality of life in Columbia. As stated on the American Trails website:

"There are many benefits of trails and greenways that planners, funders, and the public need to know about: they make our communities more livable; improve the economy through tourism and civic improvement; preserve and restore open space; and provide opportunities for physical activity to improve fitness and mental health."

Local surveys reveal that the majority of Columbia citizens use the trails, and trails rank as the most important Parks and Recreation facility for Columbia households. Columbia's trail connection to the Katy Trail State Park is an avenue to attract visitors to Columbia from across the state. As Columbia's trail system continues to develop, it has the potential to draw even more events and become a visitor attraction in its own right.

³ Impact of the MKT Trail on Nearby Property Owners (Bai and Stanis 2013)

With an approved Trails Plan in place, Columbia is poised to fulfill the Community Visioning goals set for trails and greenways as expressed below.

“Imagine Columbia’s Future - Trails Goal ‘An extensive, safe network of trails will accommodate a variety of users ranging from recreational to non-motorized travelers. This network may include roadway and public transportation infrastructure to connect parks, neighborhoods, schools and businesses.’

Imagine Columbia’s Future - Greenways Goal ‘An extensive network of greenways will play a significant role in providing transportation options, protecting wildlife corridors, watersheds, and floodplains, and increasing public access to natural and open spaces.’”

The City of Columbia also conducted a Parks and Recreation Needs Assessment Survey during March and April 2010, to establish priorities for the future improvement of parks and recreation facilities, programs and services within the Columbia community (Leisure Vision 2010). The survey was tailored to identify issues of strategic importance, so the City could effectively plan the future parks and recreation system. Eighty-seven percent (87%) of households reported they had visited City of Columbia parks during the past year (2009-2010) and 95% of those respondents rated the physical condition of the parks they’ve visited as either excellent (41%) or good (53%). Facilities that the highest percentage of households have used/visited during the past 12 months were: walking, hiking, and biking trails (70%), picnic shelters (50%), playgrounds (47%), nature trails (41%), and activity and recreation center (38%).

Columbia is the fourth most populous urban area in Missouri and population growth in Columbia in recent years has been significant. When the Columbia Parks and Recreation staff prepared the 2002 Facility Needs Update of the Parks, Recreation and Open Space Master Plan (PROSMP 2013), the population of the City of Columbia was 88,291; the 2014 population was reported as 109,008. Some models predict that the metro area population of Boone County will be 196,045 in 2030 (Hinkson Creek Watershed Management Plan 2010). With this growth in population come challenges in providing the recreational opportunities and high quality of life to which Columbians have grown accustomed.

In order to keep up, the Columbia Parks and Recreation Department uses long-range planning tools such as the PROSMP 2013. The plan provides city planners and local developers with the information they need when platting a new neighborhood or commercial project, and calls for a proactive approach to acquisition to be taken, reducing cost and difficulty. Through the continued vision and dedication of the citizens of Columbia, their elected officials, and the Columbia Parks and Recreation Department staff, the PROSMP 2013 will help to realize the vision for a network of attractive and safe parks and recreational amenities connected by trails and greenways that provide area residents with access to nature, recreation, and facilities for active play, both indoors and out.

III. Implementation Actions Methodology

To begin gathering information on stakeholder priorities for land conservation in the four identified CPAs, we held a meeting of the Land Conservation Implementation Committee (LandCIC) on January 23, 2015. Representatives of the Missouri Department of Conservation, Columbia Parks and Recreation, the United States Fish and Wildlife Service, and the Greenbelt Land Trust of Mid-Missouri attended that meeting to discuss their respective agency's interests in land conservation. A number of other entities were invited to the meeting but were unable to attend. Their input was incorporated into our analysis when it was offered. A second meeting was held on April 13, 2015, to review a draft of the City of Columbia's land acquisition scoring matrix and offer further input on implementation actions. An initial draft of this report was prepared following those meetings, and, following review and comment by the LandCIC, was submitted to the City of Columbia on April 30, 2015, according to the terms of the agreement. A third LandCIC meeting was held on May 11, 2015, to discuss the contents of this report and begin laying the groundwork for implementation actions. This report was then circulated to LandCIC members for review and comment in advance of its submission prior to the May 31, 2015 deadline required by the MDC Cooperative Agreement.

The methodology for compiling this information is fairly straightforward. The LandCIC has provided a venue for discussion and consensus building for implementation actions, and further communications were conducted with LandCIC members, both electronically and in person. We have compiled the results of these discussions into coordinated implementation actions, which we have sorted geographically: first, actions for all of Boone County, and then, actions for each of the Conservation Priority Areas (CPAs). These actions were then divided into two subcategories: Outreach and Land Conservation. Outreach actions are geared towards informing citizens and other stakeholders about the ONL effort in Boone County, and toward engaging those stakeholders in the process, whether by simple public input, volunteerism, or direct involvement in conservation efforts. Land Conservation actions are directed specifically at conservation goals: the acquisition of fee title or conservation easement interests in priority areas, or improving the natural resource value of lands and waters, regardless of ownership.

IV. Boone County, Columbia, and Developing Conservation Priority Areas

Boone County

Boone County is about 41 miles long, and about 22 miles wide, with a land area of 442,259 acres, or about 691 square miles. Boone County has a population of 162,642 (2010 US census). Of that population, 43,335 people, or 26%, live in the unincorporated areas of the county. The largest city is Columbia, with a 2014 population of 109,008. Columbia is the second fastest growing community in Missouri. The City's current area is over 60 square miles, with an average annexation rate of 0.6 square miles per year.

Boone County is an ecologically diverse area where the Central Dissected Till Plains Ecological Section (pre-settlement prairie) meets the Ozarks Highlands Ecological Section, with the Missouri River valley along its southwestern boundary. This intersection of two major ecological sections has created a unique area of highly variable topography and land cover with a remarkable diversity of Ozark, prairie, and big river plant and animal species. Except for a few streams in the extreme northeast part of the County, all Boone County streams flow into the Missouri River. The headwaters of many streams start out as prairie-type streams (i.e., entrenched in glacial till), but transition into streams that are more typical of the Ozarks (i.e., rock outcroppings along the banks with substrates of rubble, gravel and sand). Stream flows vary from flowing water at all times (perennial streams) to intermittent flows to only isolated pools with little or no flow to freshen them.

The eastern portions of Boone County are classified as the Grand Prairie Prairie Plain Landtype Association, which lies within the Claypan Till Plains Subsection of the Central Dissected Till Plains, a flatter area containing mainly poorly-drained prairie soils with claypans. Most of the surface is flat or gently rolling with local relief less than 100 ft. This area was more than 75% prairie before settlement and was known as the Grand Prairie for its great expanse (Nigh and Schroeder 2002). Seasonally inundated wetlands were common throughout the prairie and narrow bands of oak savanna and woodlands with marshes and bottomland forests would have occurred along stream courses. Today, very little natural vegetation remains, and most grasslands, prairie and woodlands have been converted to cropland; pasture and hay are the two most abundant crops in Boone County (129,000 acres) while soybeans and corn cover approximately 60,000 acres combined. All natural communities are rare in this ecoregion because of the high degree of agricultural conversion. Communities that should be high priority for protection include hardpan (i.e., claypan) prairies, lowland flatwoods, and ephemeral wetlands. Tucker Prairie (Calloway County) is the only claypan prairie remnant known from the Till Plains and Rocky Hollow Natural Area (Monroe County) contains an oak woodland remnant. Efforts to identify and restore glacial prairies, wetlands and prairie/woodland landscapes are needed.

In ecological terms, roughly the western half of Boone County lies within the Outer Ozark Border Subsection. Three Landtype Associations (LTAs) are described within this area. The Harrisburg Oak Woodland/Forest Hills LTA encompasses the hills of the upper Perche Creek watershed in northwestern Boone County, where saline groundwater occurs. It is separated from the Rock Bridge Oak Woodland/Forest Low

Karst Hills LTA further to the south, because there is less local relief and karst is absent. Historically, this area would have been covered with oak woodland and forest, with no evidence of prairies. Today, the upland surface have mainly been converted to pasture with a very small amount of cropland. Second-growth forests and old fields with dense cedar-hardwood can be found in rugged areas.

The Rock Bridge Oak Woodland/Forest Low Karst Hills LTA within the Outer Ozark Border Subsection of the Ozark Highlands, is a narrow belt of hills and bluff lands bordering the Missouri River with relief of 150-250 feet. Slopes are steep and bedrock exposures are common; it is separated from other surrounding LTAs on the basis of well-developed karst. Historically, this area was timbered in oak savanna with widely-scattered trees on high, smooth uplands and open oak woodlands and dense, well-developed forests in the more rugged landscapes, with an occasional prairie and glade opening on the flatter ridgetop areas. Today, the wooded slopes are covered by second-growth forests with overgrown dolomite and limestone glades and pasture lands. Three natural communities within this LTA are classified as “Imperiled” and six are considered vulnerable by the Missouri Department of Conservation (Table 2). High-quality prairies are absent from this LTA. Much of the oak savannas and woodlands have been converted to forest in the absence of fire, grazing or other “natural” disturbance and glades are rare and severely overgrown. Large tracts of bottomland forests are also rare. Fens, seeps and sinkhole ponds are rare and fragile, but some of the most outstanding limestone cliffs in Missouri are in this region. Caves are locally abundant in several karst plains and stream communities with unique assemblages occur close to the Missouri River.

Finally, the Lower Missouri River Alluvial Plain LTA constitutes the southern boundary of Boone County and contributes much to the scenic value of the County. This LTA extends from Arrow Rock to St. Charles and conspicuous bluffs line the LTA on both sides. The river channel, often half of its former width, is restricted and controlled by man-made alterations. Most (95%) of the areas of the floodplain that are protected by levees are row croplands, but several areas are also protected as public lands. Bluffs restrict the relatively narrow alluvial plain, and the dolomites and limestone bluff faces have been sharpened by quarrying and by railroad construction at their base. The Katy Trail State Park extends through the river valley near the base of the bluff on the Boone County side. The loamy soils historically supported dense stands of bottomland forests, but only a few remnants of those forests have survived.

According to the 2007 U.S. Agriculture Census, there are over 1,300 farms in Boone County with an average size of 196 acres. The total land used for farming is almost 259,000 acres. Boone County is ranked third in the state for horse and pony sales and production. Crops include soybeans, hay and forage crops, and grain crops such as corn, wheat and sorghum. Other agriculture includes nursery and greenhouse products, as well as sod. Local farmer’s markets help maintain the production of vegetables, melons, and potatoes. Healthcare, Higher Education and the Insurance industry are major employers in the region.

| COMMUNITY TYPES | *STATE RANK | COMMENTS |
|--|-------------------|--|
| Dry limestone/dolomite woodland | S3: Vulnerable | 1999 Lehey; three patches along a SW facing bluff (2,7 & 3 acres); portions on MDC Hart Creek CA and portions on private land. |
| Dry loess/glacial till prairie | S2: Imperiled | 1984 Reese; 1998 Lehey reported site in-tact; found on Easley bluff, might actually be a glade and not prairie; on private land. |
| Dry loess/glacial till woodland | S3: Vulnerable | 2003 Johnson and George; 4 ac woodland within 10.7 ac area on Eagle Bluffs CA, but may extend onto private land. |
| Dry-mesic limestone/dolomite forest | S3: Vulnerable | 1984 Reese, Gerad and Gremaud; 2011 Lehey; two sites – 9.1 ac on MU-owned Schnabel Woods Natural Area and another on private land along Brushy Creek. |
| Dry-mesic loess/glacial till forest | S3: Vulnerable | 2001 Lehey; 2003 George; 2012 Lehey and Newbold; four sites – one each on Eagle Bluffs CA, Three Creeks CA and Hart Creek CA, and one on private land along Brush Creek. |
| Limestone glade | S2: Imperiled | 1998 Lehey reported site in-tact; 2001 Lehey; two sites on Three Creeks CA and one site called “Bonne Femme glades” on private land. |
| Mesic bottomland forest | S2: Imperiled | 2001 Lehey; 2011 Lehey; one site is stands on two small terraces along Bass Creek within Three Creeks CA, another (24-31 ac) site on MU property along Brushy Creek. |
| Mesic limestone/dolomite forest | S3: Vulnerable | 1984 Reese; 2001 Lehey; two sites – one 22.9 ac site in Schnabel Woods NA and another site on a ridgetop in Three Creeks CA. |
| Mesic loess/glacial till forest | S3: Vulnerable | 1997 Lehey; 2012 Lehey and Newbold; one 70.5 ac site near Eagle Bluffs CA and Schnabel Woods CA, and other stands 1-16 ac in size on Hart Creek CA. |
| *State Ranks are assigned by Missouri Department of Conservation using criteria similar to species ranks; global ranks are not applied to natural communities due to the difficulty in reconciling Missouri’s classification system with larger scale classifications. | | |
| Table 2. Terrestrial natural communities within the Rock Bridge Oak Woodland/Forest Low Karst Hills Landtype Association that are classified as either imperiled or vulnerable. Many of these natural community sites are protected on public lands, but priority will be given to protection measures for the in-tact communities that have been identified. | | |

City of Columbia

The population in 2014 grew to 109,008 people, from 69,101 in 1990. On average, Columbia gains more than 1000 additional people each year. The Hinkson Creek Watershed Management Plan (2010) states that the population of the Columbia Metro Area is expected to increase to 156,836 people by 2030, while the population of Boone County is expected to be 196,045 by 2030 (assuming an average effective annual growth rate of 1.5% based on a percentage of population growth that is in the mid-range of the 1980's (1.15%) and 1990's (2.05%). This means that Columbia will contain 80% of the expected population of Boone County in the next 15 years. It is obvious that Columbia is an expanding urban area, and agriculture, though still a dominant feature on the landscape, now plays a secondary role in Boone County's economy.

In February of 2013, Forbes ranked Columbia as one of the "25 Best Places to Retire in 2013," stating:

"When it comes to non-financial factors, besides weather, we looked at such factors as availability of doctors, crime rates and encouragement for an active retirement—good biking and walking trails (as measured by Bicycling Magazine) and a high level of community volunteering."

Forbes also stated "parks can break up the landscape, and in areas with slightly more density, can play a vital role where yards might be at more of a premium. Parks often have shared resources like pools, community centers and playgrounds, which open up access for people who have neither the money nor space to accommodate them on their own. They become gathering places and hosts to festivals, picnics and fireworks. Likewise, going to a farmers market can be a pleasant outing and a chance to run into friends and family." Columbia is an increasingly bicycle-friendly community, with a city program to encourage cycling, walking and public transportation. The MKT Trail takes cyclists and hikers all through Columbia and links to the 225-mile Katy Trail, which stretches across the state.

Conservation Priority Areas

As the ONL collaboration progressed, it became obvious that discussions were centered on certain geographically identifiable areas (e.g., watersheds). Thus, identifying "focus areas" was a means to facilitate communication among stakeholders who expressed mutual interests for particular areas. A focus area became a "priority area" when a team of partners developed a common vision of issues and identified specific actions that they could take collectively to achieve their objectives. Defining focus areas also aids in coordination of programs among state and federal agencies and their conservation partners, and allows the identification of mutually beneficial objectives with measureable goals. It is also better to focus messages to private landowners within distinct priority geographies, because these areas and the people that live there are usually distinctive in different ways. Likewise, expertise and guidance from resource

professionals can be focused on smaller areas to provide the most appropriate assistance where the need is the greatest. The concept of priority areas follows the precedent of Conservation Opportunity Areas that were established for the Missouri Comprehensive Conservation Strategy (Missouri Department of Conservation 2015).

Originally, five Conservation Priority Areas were identified during development of the ONL plan (page 11, *Our Natural Legacy: A Plan for Columbia and Boone County*, 2014). However, these areas were more conceptualized in nature at that time and, for the most part, did not entirely depict geographically distinct units that could be identified easily by conservation partners; it was difficult to justify boundaries and define what they represented. Most importantly, it became evident that some areas where future efforts were definitely going to be focused were not included within these areas. For these reasons, adjustments were made to the boundaries of the five previous ONL Priority Areas and one additional Priority Area (Hart Creek CPA) was created to include all of the portions of southern Boone County that are the focus of this project (Figure 1).

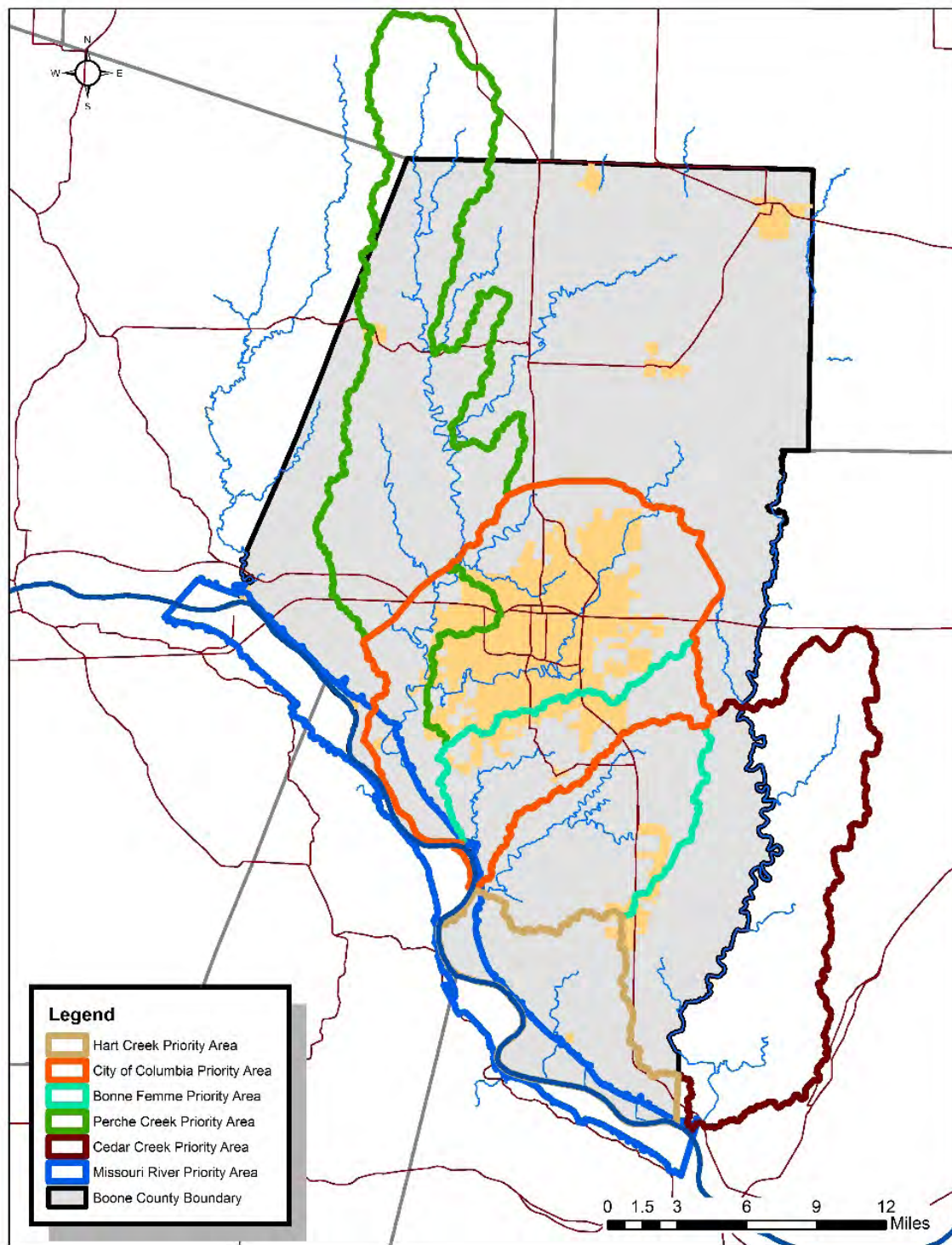


Figure 1. The boundaries of six Conservation Priority Areas in Boone County, Missouri, modified from the Our Natural Legacy plan by the Land Conservation Implementation Committee.

V. The Conservation Fund Green Infrastructure Network Design Study

As part of the initial collaborative process (2013-2014) that developed the ONL plan, Community Initiatives integrated the services of The Conservation Fund (TCF), a strategic conservation planning organization that has performed green infrastructure activities in nearly 40 states, including the completion of greenspace plans for three of the largest metropolitan areas in the country. Specialists from TCF (Will Allen, Ole Amundsen, Jazmin Varela) and Community Initiatives (Roger Still) established a Technical Committee to provide critical local knowledge and feedback to the GIS-based Green Infrastructure Network design protocol, a technical methodology used by TCF to conceptualize an interconnected network of resources across multiple scales; the goal was to identify priority areas of habitats where conservation projects could be undertaken to help protect the existing green infrastructure network in Boone County.

The Technical Committee included people from the City of Columbia, (Dan Schneiderjohn; Mike Snyder), Greenbelt Land Trust (Dave Bedan), the University of Missouri School of Natural Resources (Dr. Rose-Marie Muzika), Missouri Department of Conservation (Doug Novinger; Steve McMurry; Brad Jacobs; and Tim Nigh), U.S. Forest Service (Sybill Amelon), U.S. Fish and Wildlife Service (Shauna Marquardt; John Weber), U.S. Geological Survey (Esther Stroh), and a private citizen (Randal Clark). TCF used the best available data and technical methodologies to craft a green infrastructure network design through collaboration with these local partners that served on the Technical Committee.

The technical team synthesized community input and the best available science and data to develop a green infrastructure ‘network design,’ composed of core areas, hubs, and corridors. The building blocks of the network are ‘core areas’ (well-functioning natural ecosystems that provide high-quality habitat for native plants and animals and serve as the nucleus of the ecological network). ‘Hubs’ are aggregations of core areas that are also the areas that contribute most to ecosystem services like clean water, flood control, carbon sequestration, and recreation opportunities. ‘Corridors’ are relatively linear features linking cores and hubs together, providing essential connectivity for animal, plant, and human movement.

All outputs of the Technical Committee, called Ecological Networks and Restoration Opportunities, were reconciled into three tiers or levels. These tiers were not intended as any ranking scheme, but rather as a function of the implementation tools needed to achieve conservation goals.

Tier I - existing high quality landscapes and freshwater systems (referred to in the Technical Report as Ecological Network on the ground). These areas identified in the analyses were core grasslands/prairies (note: even core areas may require restoration), core wetlands, core woodlands and forests, and core streams.

Tier II – areas where opportunities could be pursued proactively in terms of conservation, but are in need of restoration. These areas identified in the analyses were grasslands/prairies, wetlands, and streams; no woodlands or forests were identified.

Tier III – areas where opportunities require significant investment to restore any ecological function, either due to fragmentation, impairments, invasive species, etc. These areas identified in the analysis were grasslands/prairies, wetlands, and streams; no woodlands or forests were identified.

Only the locations of Tier I Ecological Networks are illustrated in this report, in an attempt to identify priorities for conservation actions. These Tier I areas should be examined further to determine if their ecosystem functions are intact; those in need of restoration should become the highest priority areas for conservation actions. The Tier II areas in need of restoration that are contiguous with or connected to intact Tier I areas could also be evaluated for restoration feasibility.

Forests

Many locations identified as forests are likely woodlands under suppressed fire regimes or fall somewhere in the continuum of forest-woodland; the feasibility to manage these areas with prescribed fire (i.e., safety, landowner acceptance) will determine if they can be restored as natural communities. During their analyses, TCF and the Technical Committee searched for large continuous forest tracts (>1,975 acres) in the Ozark Highlands portion of Boone County. However, very few locations in Boone County meet these requirements. To maximize benefits to woodland species, TCF searched for blocks of continuous forest that were 247 acres in size to determine restoration potential. For woodlands, they identified patches >247 acres (although most woodland species need more than a 247 acre tract; there are few woodland patches left in Boone County that met this threshold. TCF used the same threshold for forest and woodland with the rationale that the two could be combined (and managed) to form larger woodland tracts. Patches on ridges and upper slopes (i.e., dry or dry-mesic sites), but not in mesic or wet-mesic cells, were classed as woodland. The remaining canopied cells (i.e., those in mesic or wet-mesic cells) were classified as forest. Using these criteria, 56 Tier I forest areas (37,739 acres) and seven woodland patches (2,347 acres) were identified (Table 3; Figure 2).

Urban forests were extracted from various data sources that apply within the City of Columbia and metro region. No species or size thresholds were applied. Urban forests serve many functions in a developed environment including, but not limited to, cooling, air purifying, run off absorption, carbon sequestration, etc. The Tier I Core Urban Forest was extracted from the forest and woodland data as a stand-alone coverage (Table 3; Figure 3). There were 5,360 patches of urban forest (23,206 acres) identified.

| COMMUNITY TYPE* | NUMBER PATCHES or SEGMENTS | TOTAL AREAS (ACRES) | TOTAL LENGTH (MI) |
|--|---|------------------------------------|----------------------------------|
| TIER I CORE AREAS | | | |
| Forests | 56 | 37,739 | |
| Woodlands | 7 | 2,347 | |
| Urban Forest | 5,360 | 23,206 | |
| Grassland/Prairie | 78 | 26,630 | |
| Bottomland Wetland | 2,471 | 10,805 | |
| Emergent Wetland | 6,695 | 3,027 | |
| Streams | 1,609 | | 1,861 |
| | | | |
| TIER II PRIORITY RESTORATION AREAS | | | |
| Grassland/Prairie | 1,040 | 17,079 | |
| Wetlands (Bottomland & Emergent combined) | 1,202 | 6,522 | |
| Streams | 203 | | 198 |
| | | | |
| TIER III POTENTIAL RESTORATION AREAS | | | |
| Grassland/Prairie | 142 | 45,093 | |
| Wetlands (Bottomland & Emergent combined) | 3,280 | 80,503 | |
| Streams | 29 | | 36 |
| | | | |
| *source for community type and statistics for each type was The Conservation Fund, Our Natural Legacy: A Plan for Columbia and Boone County Network Design Methodology (Varela 2013) | | | |
| Table 3. Results of The Conservation Fund's and ONL Technical Committee's development of a green infrastructure 'network design,' reconciled into three tiers or levels as a function of the implementation tools needed to achieve conservation goals. | | | |

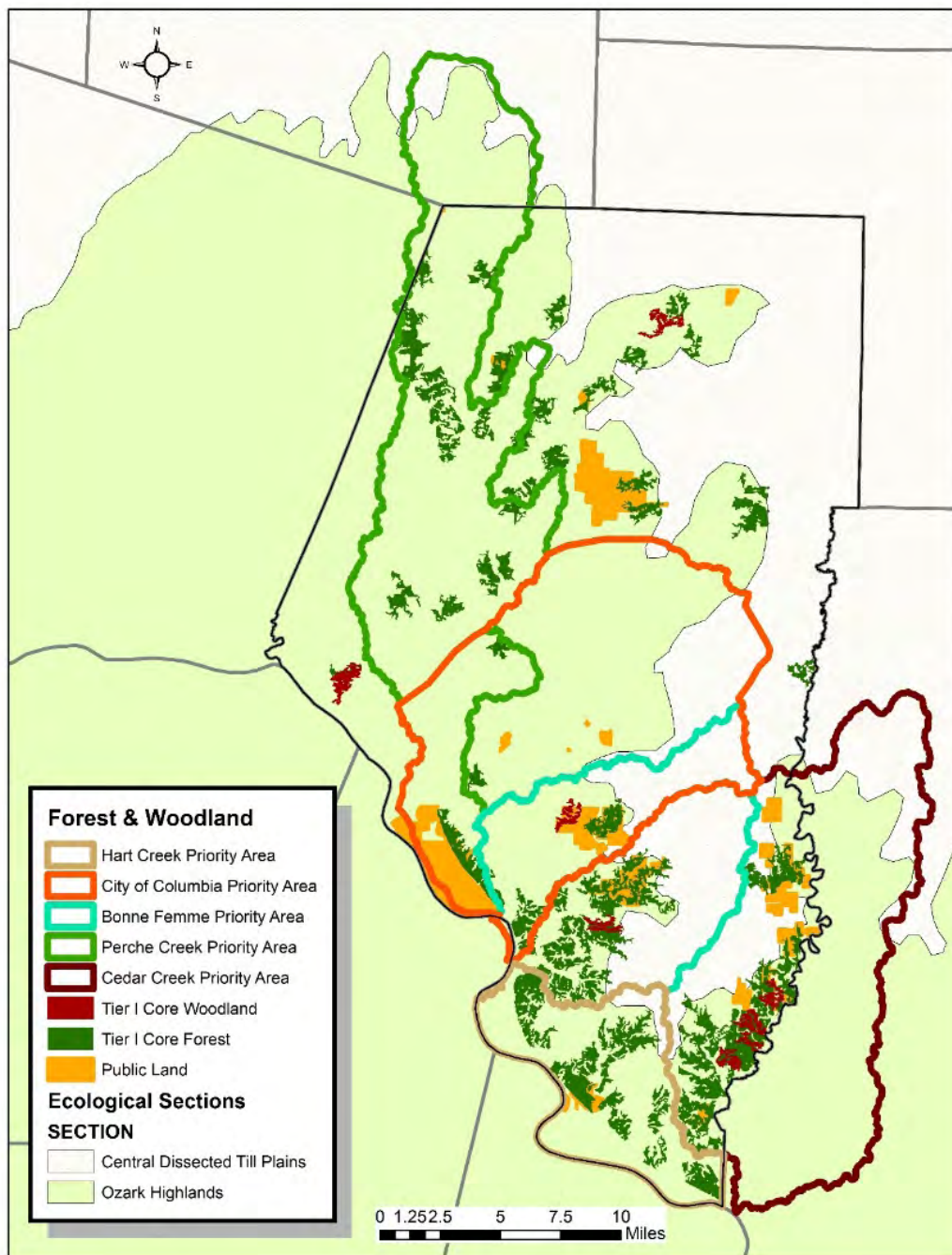


Figure 2. The locations of Tier I Core Woodlands and Forests in relation to the boundaries of the six Conservation Priority Areas in Boone County, Missouri.

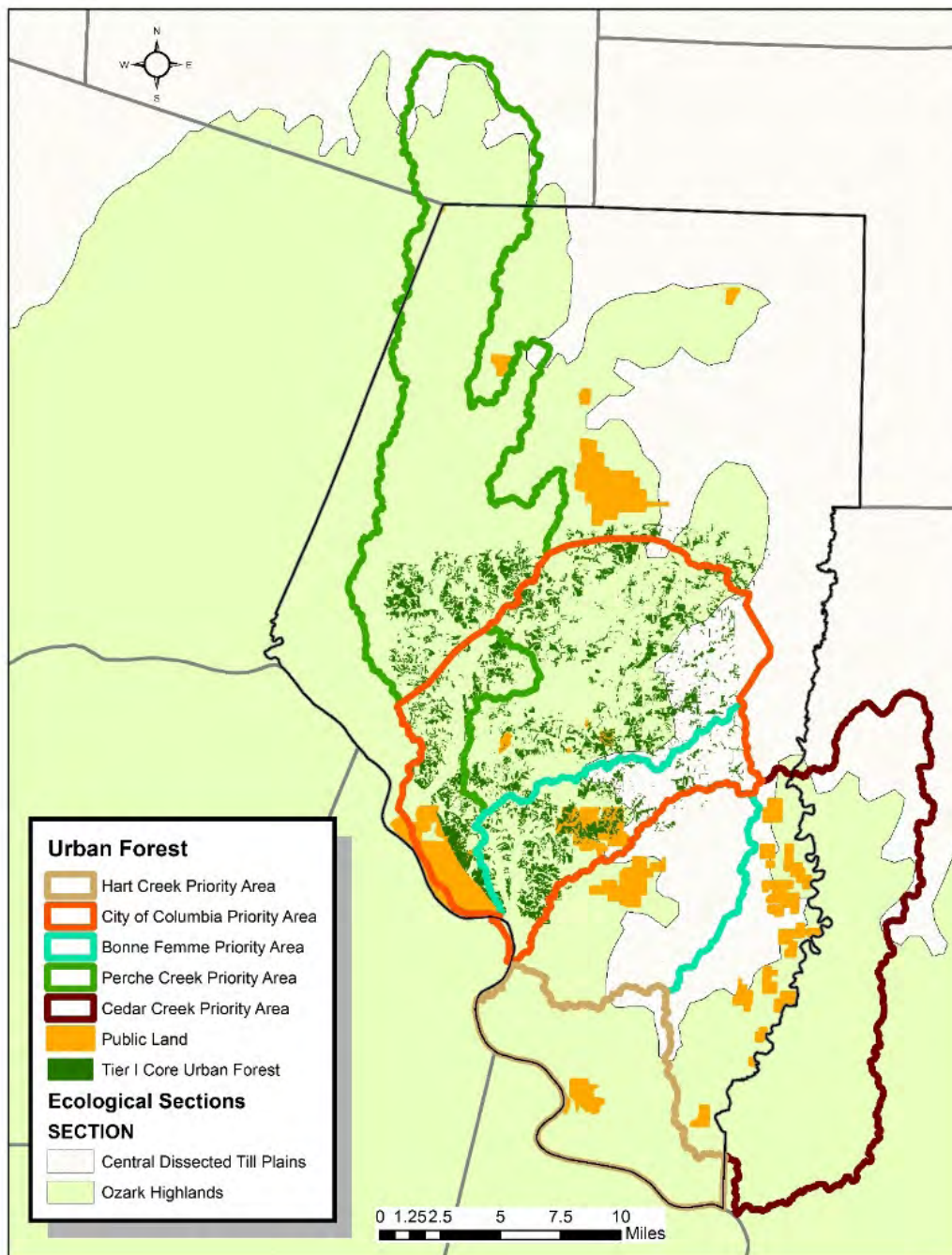


Figure 3. The locations of Tier I Core Urban Forests in relation to the boundaries of the six Conservation Priority Areas in Boone County, Missouri.

Grasslands

Most grasslands and prairies have been converted to row crops (60,000 acres), or pasture and hayland (129,000 acres) in Boone County. Therefore, any native grassland natural communities are high priorities for conservation in Boone County. Areas identified as patches inside or in close proximity to the pre-settlement prairie area were Tier I (larger than 125 acres) and Tier II (less than 125 acres), while Tier III were patches in the Ozark Highlands Section that were larger than 125 acres. There were 78 patches (26,630 acres) identified by TCF analyses as Tier II grassland/prairie priority areas (Table 3; Figure 4), most of which occurred in the Central Dissected Till Plains. These areas represent the best potential for restoration as large, continuous blocks of grassland/prairie habitat. In contrast, the Tier III areas identified as potential grassland/prairie restoration area (Table 3; Figure 4) occurred primarily in the Ozarks Highland. While some prairie pockets undoubtedly existing naturally on the dryer ridgetops and were maintained by fire in the pre-settlement landscape of this area, today these areas most likely represent former forests and woodlands which have been converted to cool season pasturelands. Therefore, opportunities for Tier III grassland community restoration might actually represent glade or savanna habitat,

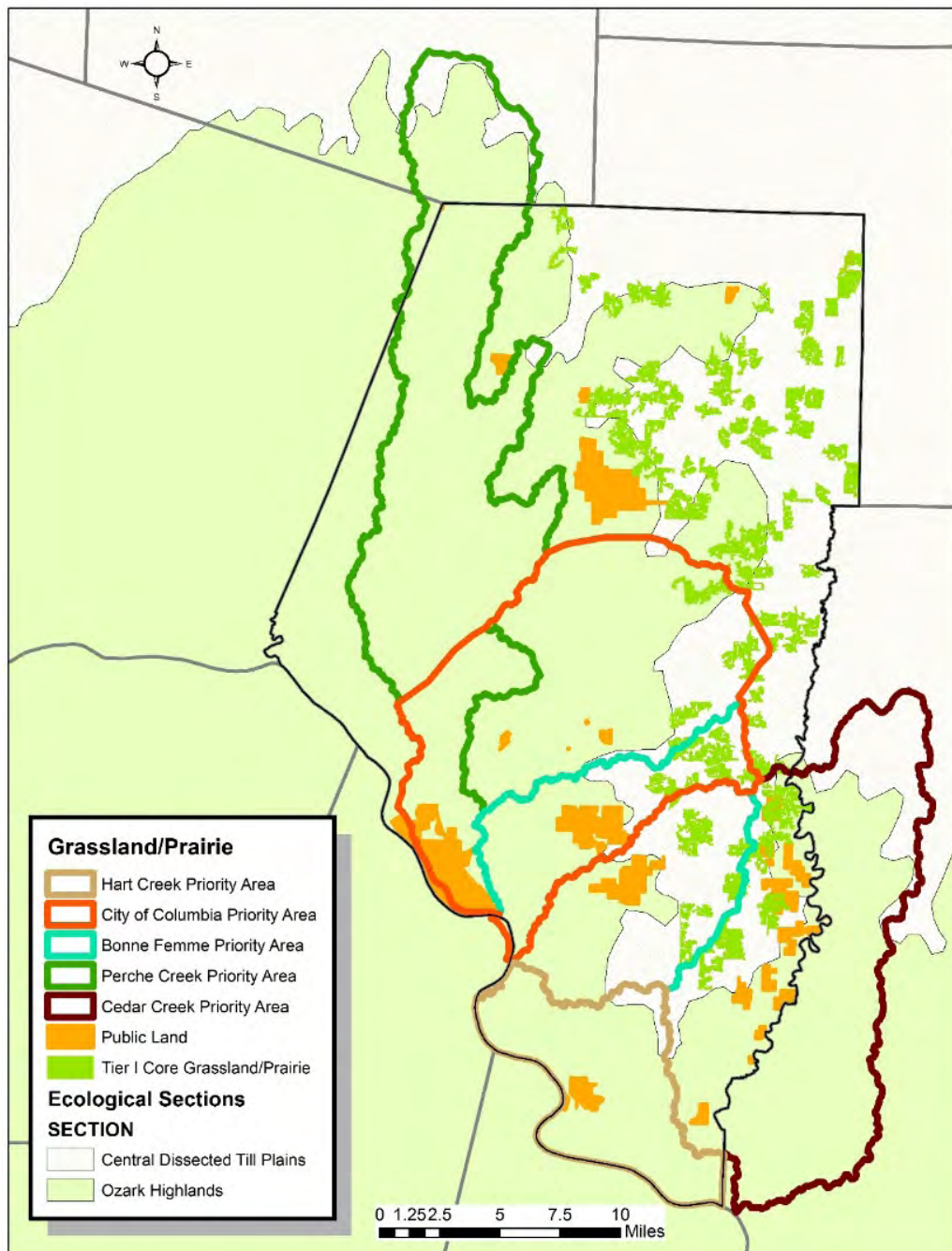


Figure 4. The locations of Tier I Core Grassland/Prairie in relation to the boundaries of the six Conservation Priority Areas in Boone County, Missouri.

Wetlands

According to TCF and the Technical Committee, approximately 75% of the 6,695 existing emergent wetlands (3,027 acres) classified as Tier I are less than 2 acres in size. There were 2,471 patches (10,805 acres) of bottomland wetlands included in the Tier I areas (Table 3; Figure 5). Wetland restoration opportunities (i.e., Tier II and III areas) were defined as a broad range of areas within the 100-year floodplain of streams and areas that have hydric soils. Because wetlands provide many services to communities it was decided that all existing wetlands should be maintained as core areas. Also, because data sources that were available for use were rather coarse resolution (2005 LULC; woody-dominated wetland and herbaceous-dominated wetland), or have not been verified (NWI freshwater emergent wetland, freshwater forested/shrub wetland, and riverine), all wetlands identified in TCF analyses need to be field verified. Wetland restoration opportunities were identified as a broad range of areas within the 100-year floodplain zone and areas that have hydric soils, therefore, some of these areas could be existing wetlands with varying degrees of functionality or areas where wetland restoration or creation might be feasible (Table 3; Figure 5).

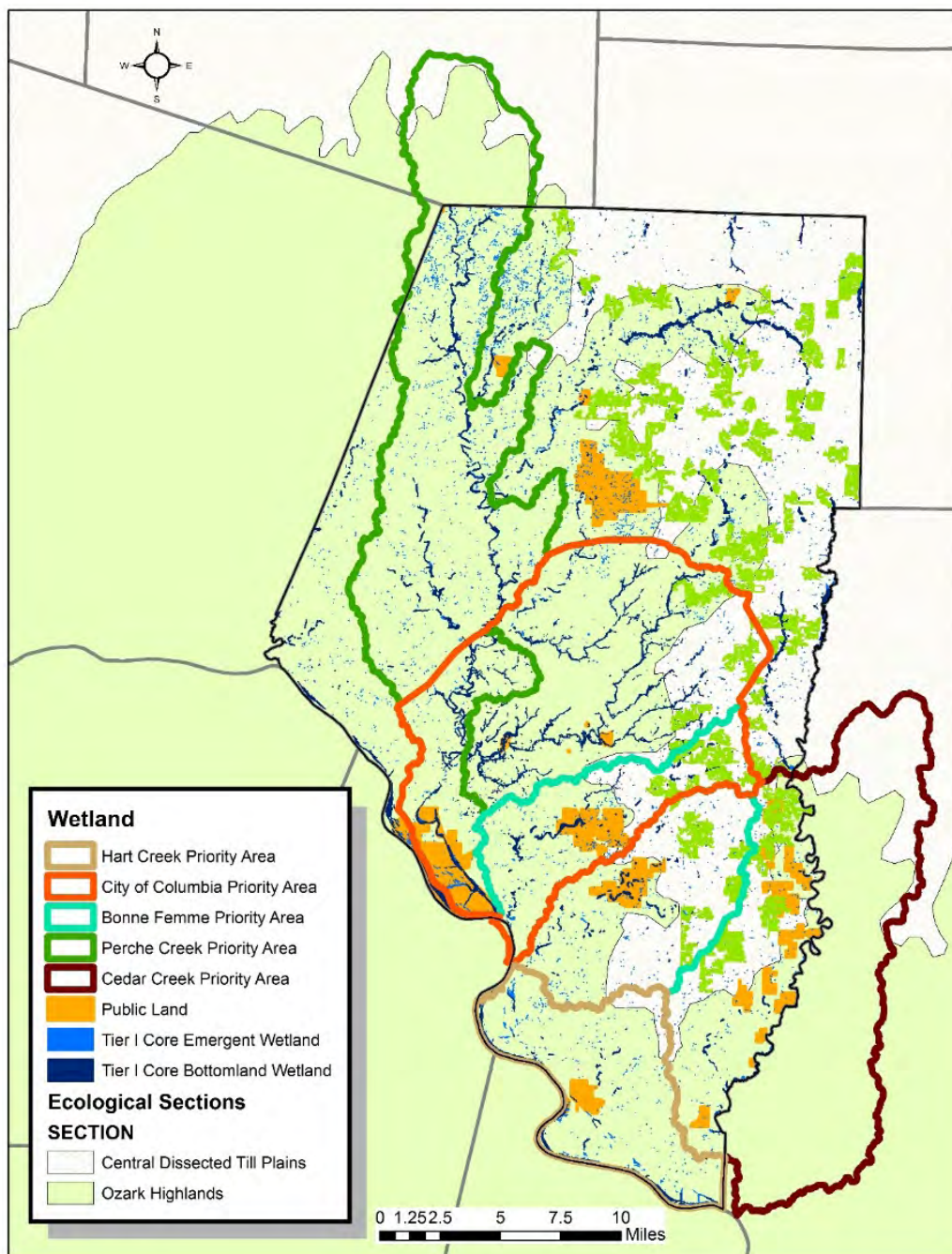


Figure 5. The locations of Tier I Core Emergent and Bottomland Wetlands in relation to the boundaries of the six Conservation Priority Areas in Boone County, Missouri.

Streams, Lakes and Other Water Bodies

During TCF analyses, any streams located within a watershed with >45% forest cover were designated as Tier I Core Streams. There were 1,609 stream segments that met these criteria (Table 3; Figure 6). In the Central Till Plains, the most threats to stream water quality and their biota are found in the streams that originate as prairie headwater streams, including their associated wetlands and wet prairies. The Tier II Priority Restoration Streams (203 segments; 198 miles of length) were identified as those streams located within a Conservation Opportunity Area (COA; Missouri Department of Conservation) with an impairment in place (i.e., 303(d) list), or within a forested watershed with a known impairment. The Tier III streams identified as Potential Restoration (29 segments; 36 miles of length) corresponded to those streams that have water quality impairment, but are not co-located within a COA or a forested watershed.

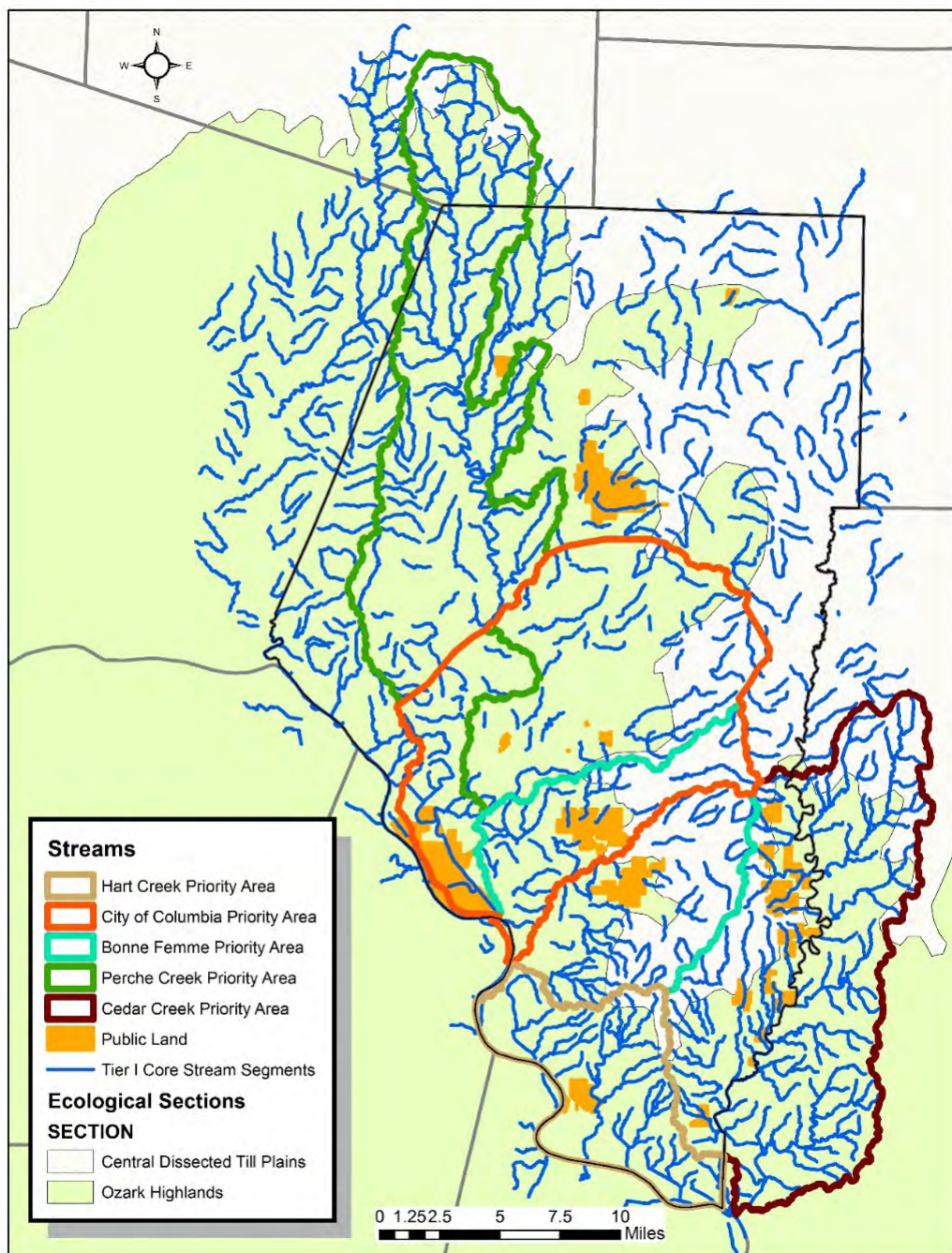


Figure 6. The locations of Tier I Core Stream Segments in relation to the boundaries of the six Conservation Priority Areas in Boone County, Missouri.

III. Recommended Implementation Actions

A. *Boone County*

Conserving natural areas and farmlands is important to the quality of life of the citizens of Boone County as Columbia continues to grow into greater Boone County. The ONL partners will utilize voluntary methods with private landowners such as conservation easements and strategic fee title acquisitions to achieve conservation actions. Being a good steward of conserved land sometimes means more than just leaving the land untouched. Habitat management involves manipulating the types, amount, or arrangement of food, water and cover for the purpose of making the habitat more suitable for a specific species or group of species. Allocating resources to create habitat is a growing movement within municipal parks and recreation departments for wildlife management and wildlife viewing opportunities. Participation in wildlife-associated recreation has increased in 28 states since 2006, according to the findings of the 2011 report released by the U.S. Fish and Wildlife Service. Overall, the 2011 survey found that 38% of Americans 16 years of age and older participated in wildlife-related recreation in 2011, an increase of 2.6 million participants from the 2006 survey. Specifically, 11% more Americans fished and 9% more hunted in 2011 than in 2006.

i. *Outreach*

The overarching goal of outreach for the ONL plan is simple: to inform citizens and other stakeholders about conservation efforts in Boone County, and to provide them with the opportunity to engage in those efforts. A significant portion of this effort is essentially marketing: individuals need to be informed about the work of all ONL participants, and they need to be provided with enough knowledge to understand its benefits. Specific points that should be emphasized are that the risks of implementing the ONL plan are minimal – that “stranger danger” is overstated as a result of trails development, for example, or that the recreational liability law provides protection for landowners with property adjoining public lands – and that the benefits of these efforts to human health, through prevention of contamination and the wellness benefits of access to outdoor amenities, far outweigh any associated risks.

The most vital pieces of the outreach puzzle, however, are simply the knowledge of what amenities are available, and who is working to provide them. Effective marketing of trail access, scenic values, and land conservation to both citizens and visitors are vital to maintaining support. Creating a centralized, user-friendly list of access points for conservation friendly recreational activities like hiking, floating, fishing, and hunting would be an excellent first step. Marketing efforts should make an effort to provide advertising for the cooperating entities as well, because continued public support of those entities is vital to the continued implementation of the ONL plan.

List of Recommended Actions

- Transition LandCIC into an implementation committee to assign, plan, and begin carrying out the goals established in this report by end of 2015

- Use advertising and marketing strategies to emphasize the benefits and explain the limited risks associated with outdoor amenity development
 - Work with University of Missouri Law School and Land Trust Alliance to create CLE program on conservation easements
 - Explore similar education opportunities with related professional groups (e.g., financial and estate planners, accountants, etc.)
- Coordinate ONL stakeholders to promote Columbia and Boone County for Outside Magazine's Best Town Ever competition in 2016
- Create a centralized, user-friendly list of outdoor amenities to reduce the information cost of use to citizens and visitors
- Create a topical list of information on property conservation options
- Create educational and recreational programming opportunities regarding land use management and natural resource conservation
- Work with Columbia Tree Task Force to develop and implement specific goals related to urban tree cover and riparian corridor reforestation
- Promote conservation friendly planning, zoning, and land use

ii. *Land Conservation*

The first and most fundamental goal of the ONL land conservation efforts should be to avoid random acts of conservation. Scattered, uncoordinated efforts at conservation are markedly less effective than conservation efforts that are coordinated and focused for maximum impact. To that end, prioritization of land conservation goals should be directed according to the following three principles:

First, buffering of important natural resources. The Missouri Department of Conservation has stated that the restoration of riparian corridors is a priority, and the U.S. Fish and Wildlife Service highly values buffering of existing refuge lands. The reason for this is simple: neither water nor wildlife conforms to political boundaries. Restoration and maintenance of land cover in riparian corridors in its natural, permeable state vastly reduces the contamination of waterways, and the conservation of natural habitat adjacent to refuge lands provides much greater biomass to support the ecosystem of the refuge, even if public access is not available in the buffer lands. The diversity of ownership and landowner intent in lands buffering these resources requires coordination among all stakeholders: if a landowner is not interested in selling, he or she may well be interested in granting a conservation easement, or vice versa. Communication between entities is key.

The second principle for developing a land conservation effort in Boone County is connectivity: for the citizens of Boone County to value the natural resources available, they must be connected to them. As such, conservation lands need to be connected both to each other and to the population. The City of Columbia has gotten a substantial head start on this process with the development of the extensive trail system, and further development should increase the system's already considerable value. These efforts need to be coordinated with the development of public lands, so as to make accessing those lands as straightforward as possible. Additionally, a diversity of access must be maintained: trail access is vital, but access by road is also necessary for some users.

Additionally, though not every resource can be made accessible to those with different needs, an effort should be made to ensure that some access is developed to that end. Finally, access to the streams and rivers is of vital importance. Even if small, places that allow the public to fish and otherwise access waterways for recreational purposes increase their connection to those resources.

The third principle to be incorporated into land conservation actions in Boone County is species oriented conservation. In other words, land conservation should be directed toward conserving habitat for species whose populations are in danger of extinction, are unusually sensitive to changes in habitat (e.g., migratory birds and insects), or are necessary for the function of the ecosystem as a whole (e.g., pollinator species). The Natural Heritage Database tracks sightings of threatened and endangered species, allowing identification of parcels providing habitat to those species. Similarly, data regarding migratory routes are relatively well developed, and habitat for migratory birds should be prioritized when possible. More recently, increased efforts are being made to restore and conserve habitat for pollinators. The City of Columbia Parks and Recreation Department is working with beekeepers to provide locations for the installation of hives, and the US Fish & Wildlife Service can provide technical assistance to develop a list of plants necessary to support native pollinators. The significant obstacles to the proliferation of pollinator-friendly plantings are essentially knowledge – which must be centralized and better circulated – and funding.

List of Recommended Actions

- Utilize LandCIC to facilitate communication and connect landowners with the conservation organization best suited to their needs
 - Create lines of communication so that information and funding opportunities through mitigation and other avenues are effectively utilized
- Prioritize conservation of land according to natural resource values as described in this report (e.g., Tier 1 Core Habitats); also utilize City of Columbia's land acquisition scoring matrix to do so according to the timeline established by the implementation contract signed December 17, 2014
 - Incorporate T&E species records into land conservation priorities where appropriate
 - Take advantage of unforeseen conservation opportunities as they arise
- Develop literature and funding to encourage pollinator-friendly plantings on public and private lands
 - Create fund so individuals can donate to support native, pollinator-friendly plantings
- Identify groups interested in ONL goals and schedule 3 presentations before end of 2015 (e.g., Native Plant Society, Audubon, Master Naturalists, Kiwanis, Lions Club, etc.)
- Secure at least 10 conservation easements or acquisitions totaling at least 1,500 acres in Boone County by 2020.
- Identify corridors for human and wildlife connections through stakeholder and expert evaluation (e.g., riparian corridors) and conserve where feasible.

- Continue to protect interconnected natural land and water networks. It is this network that provides habitat, clean air, clean water, and significant economic, environmental, and social benefits for people and nature.
 - Find partner to aggregate shapefile of public-owned lands in Boone County

B. Missouri River Conservation Priority Area

At 2,300 miles long, the Missouri River is the longest river in the United States. The river's catchment area consists of over 529,000 square miles - one-sixth of the country's land area. With an average depth of 35' the river has a median discharge rate of just under 59,000 cubic feet of water per second at its confluence with the Mississippi River at St. Louis, Missouri.

The river forms the southwest border of Boone County. The Missouri River Priority Area includes 42,985 acres, with a primary focus on the floodplain area between the bluffs on both sides of the River, but only along the southern border of Boone County and slightly beyond. Public lands within this priority area on the Boone County (east side) portion of the River floodplain, include Eagle Bluffs Conservation Area, Hartsburg Access, a small portion of Hart Creek Conservation Area. Public lands on the west side include Overton Bottoms North and South, Plowboy Bend Conservation Area, and Marion Bottoms Conservation Area. Priority will be given to analyses that are expected to identify conservation opportunities within this area.

Habitats along the Missouri River are in constant fluctuation as seasonal floods and droughts bring about drastic changes. Efforts by the U.S. Army Corps of Engineers to control the river began full scale at the turn of the 20th century. Congress enacted the Missouri River Bank Stabilization and Navigation Project to control the river by building pile dikes to direct flow and prevent bank erosion. By 1980, the Missouri River had been channelized 735 miles from Sioux City, Iowa, to St. Louis, Missouri. Channelization dramatically reduced fish and wildlife habitat by separating the river from its natural floodplain.

The Big Muddy National Fish and Wildlife Refuge was established in September 1994, as part of the National Wildlife Refuge System, "for the development, advancement, management, conservation and protection of fish and wildlife resources." Like pearls on a string, the refuge lands are gems in the almost million-acre lower Missouri River floodplain. Refuge lands encompasses over 17,000 acres of riverine habitat along the Missouri River as units in the floodplain between Kansas City and St. Louis. Much of the information below was taken from Refuge materials.

Patches of bottomland forest and wet prairie contribute valuable habitat for nesting and migrating songbirds. Seasonal floodplain wetlands provide valuable habitat for a variety of amphibians. Bottomland forest was the dominant habitat along the Missouri River when Lewis and Clark traveled from St. Louis toward what is now Kansas City. Today, there are no "old growth" cottonwood gallery forests on the refuge, but there are several thousand acres of young (less than 20 years old) bottomland forest. This habitat is important to a number of migratory songbirds and raptors as well as many mammals, reptiles and amphibians. River side channels and chutes provide slower flowing water used by many native fish; ten at-risk species of fishes are reported from the Missouri River along this portion of Boone County. A partnership between the U.S. Army Corps of Engineers and the U.S. Fish and Wildlife Service has resulted in the construction of three additional chutes (one at Jameson Island and two at Overton Bottoms) since 2002. "Scour holes" or "blew holes" provide unique habitats on the

Missouri River floodplain; created by flood waters, a semi -permanent water body (1-40 acres) is left behind when flood waters recede. Scour holes provide habitat for fish, amphibians, turtles, birds and mammals.

The Missouri River Conservation Priority Area also includes the 240-mile long Katy Trail. Developed as the Katy Trail State Park, the Missouri Department of Natural Resources built the trail on the former corridor of the Missouri-Kansas-Texas Railroad, the nation's longest rails-to-trails project. Bill Ryan (Missouri Director of State Parks) provides a well-written documentation of the Katy Trail in the chapter, entitled "8 Feet Wide and 240 Miles Long" in the Missouri River Country book published by Missouri Life Magazine (Ryan 2013).

"The Katy travels through some diverse landscapes, including dense forests, wetlands, deep valleys, remnant prairies, open pasture-lands and gently rolling farm fields. The Katy State Park exemplifies all three aspects of the Missouri state park mission: nature, history, and recreation."

The Katy Trail is a big reason why Missouri was named the "2013 Best Trail State in the Nation" by American Trails (Ryan 2013). "The simplicity of the trail, with its flat surface mirrors the surrounding river bottoms, makes it popular with people of all physical abilities" said Ryan. He goes on to say that "just as the trail brings families together, it also helps everyone, especially children, connect with the natural world around them." The City of Columbia and Greenbelt shares this vision with the Missouri Department of Natural Resources for healthier outdoor experiences, especially for children, and that is why the Columbia Parks and Recreation Department stated in the PROSMP 2013 that "Columbia's trail connection to the state Katy Trail is an avenue to attract visitors to Columbia from across the state. And, as Columbia's trail system continues to develop, it has the potential to draw even more events and become a visitor attraction that can generate tourism dollars for the community."

The missions of the City of Columbia and Greenbelt are also compatible with the mission of the Katy Land Trust, which works to protect agricultural, scenic, and natural resources along the Missouri River, primarily with private landowners. As land trusts, the Katy Land Trust and Greenbelt believe that it is valuable for Missourians to understand why and how the farms, forests and river bluffs along the Missouri River and the Katy Trail can be conserved for future generations. Cooperation between Katy Land Trust, Greenbelt Land Trust, the City of Columbia, and the Missouri Department of Natural Resources will make the Katy Trail an even more outstanding and valuable outdoor recreational resource.

i. Outreach

The Missouri River is the central waterway of the county and region. Outreach efforts should focus on assisting ONL partners with coordination in their programs – like Missouri River Relief and related organizations – to ensure that as many people as possible are aware of not only the Missouri River, but also the ways in which their lives intersect with it. These efforts should include opportunities for volunteerism,

dissemination of information about the watershed and the way land use affects the health of the whole region, and the full range of opportunities to engage with the Missouri River recreationally. Recreational opportunities along the river are plentiful, both terrestrial – like the Katy Trail, various conservation areas, and scenic overlooks like Les Bourgeois Winery – and aquatic, as boating and fishing on the river are popular pastimes.

However, those opportunities can be maximized in value through greater coordination and promotion. Providing more information about the closely associated terrestrial recreation opportunities – perhaps through a self-guided tour that could be administered through a mobile application – will increase utilization of those opportunities, and the opportunity for aquatic recreation on the Missouri River should be promoted in a conservation-friendly fashion, emphasizing lower-impact activities like floating and fishing over heavy boating use. Partnerships should be expanded with local outdoor retailers like Alpine Shop, Walt’s Bicycle and Wilderness, and Bass Pro Shops to promote these opportunities.

List of Recommended Actions

- Coordinate efforts to promote recreational opportunities
 - Develop coordination between terrestrial recreation opportunities along the Missouri River corridor
 - Work with ONL stakeholders and local outdoor retailers to promote availability of aquatic recreational uses

ii. Land Conservation

Because the CPAs are largely constructed around watersheds, the land conservation implementation actions for all CPAs will have a substantial effect on the Missouri River CPA. However, some land conservation actions should be implemented in the Missouri River CPA specifically.

For maximum impact on the watershed, restoration and conservation of permeable land use at the junctions of the Missouri River with its tributaries should be a priority. Conserving these properties will reduce contamination from runoff and will help ensure the continued quality of the extraordinary scenery of the Missouri River Valley. Ensuring that these features are conserved for future generations should be a primary effort under the ONL plan.

List of Recommended Actions

- Prioritize conservation of lands at the junctions of the Missouri River and its tributaries
- Prioritize conservation of the scenic characteristics of the Missouri River Valley
- Prioritize conservation of regionally rare and declining habitats (e.g., bottomland hardwood forests and wetlands) in the Missouri River Valley
- Promote wise stewardship through protection of agricultural lands with consideration for habitat restoration

C. City of Columbia Conservation Priority Area

The City of Columbia CPA area is 104,572 acres and encompasses the current city limits and much of the area outside of Columbia that will be developed in future years. The western limits of this area overlap the extreme southern limits of the Perche Creek CPA. Also, a substantial portion of this area extends over into the Bonne Femme CPA (i.e., the entire Little Bonne Femme Creek Watershed). Generally, watersheds were used to delineate the limits of the City of Columbia area, and these limits were extended to ensure inclusion of all areas that are planned for future parks and trails. This area is an area of intense focus of Greenbelt's work with the City of Columbia for implementation of PROSMP 2013.

i. Outreach

The efforts of the City of Columbia's Parks and Recreation Department and Greenbelt have created outdoor amenities within the Columbia city limits that are extremely well-developed, including the Capen Park/Hinkson Creek Nature Preserve/Grindstone Nature Area complex south of the University of Missouri's campus, the extensive recreational opportunities at regional parks like Cosmo Park, and access to fishing on both streams and flat water.

A more effective job promoting these amenities should be the focus of any outreach actions in the City of Columbia. Such actions should include both simple promotion of the amenities – guided tours, for example – and promotion of the value of those amenities for human health and wellness. Land conservation efforts in an urban environment are often met with skepticism; effective promotion of the benefits of conserved land and a mitigation of the perceived risks should smooth the process somewhat.

List of Recommended Actions

- Promote land conservation efforts and existing outdoor amenities to both the citizens of and visitors to the City of Columbia, with a particular emphasis on their value in an urban environment
- Partner with land management agencies and research funding sources for development of an urban wildlife and habitat management plan to provide guidelines for integrating natural and human systems in Columbia's parks and open spaces.

ii. Land Conservation

Conservation priorities in Columbia can, at times, be difficult to leverage from agencies with statewide responsibilities (e.g. MDC, MoDNR), so existing alternative funding sources for land conservation must be maximized, and further alternative funding sources should be explored, including grant programs like the Community Forest Program administered by USDA, which can be used with match funding for land conservation efforts in urban areas.

Additionally, conservation of tree resources in the City of Columbia CPA should be more effectively coordinated. MDC's Trees Work Campaign should be integrated with public health efforts from Boone Hospital and other stakeholders, and the Columbia Urban Tree Task Force should be integrated with the future City Tree Board to formulate and establish urban tree canopy increase goals.

Finally, Greenbelt Land Trust, in cooperation with the LandCIC, has developed a scoring matrix for the City of Columbia to evaluate potential land acquisition. This matrix is designed to prioritize properties that provide as much value to the Columbia area as possible by identifying parcels available for acquisition by the Parks and Recreation Department, as well as potential conservation easement properties.

List of Recommended Actions

- Develop alternative funding mechanisms for land conservation efforts
- Integrate urban tree conservation efforts more effectively with related programs
- Utilize City of Columbia Land Acquisition Scoring Matrix to prioritize land acquisition projects, including both fee title and conservation easement acquisition

D. Bonne Femme Conservation Priority Area

The Bonne Femme Watershed was one of the original five Conservation Priority Areas identified by the ONL planning effort. The watershed area covers approximately 93 square miles (61,156 acres), which is about 15% of Boone County, and includes parts of Columbia and Ashland, and the immensely popular recreation destinations of Rock Bridge Memorial State Park and Three Creeks Conservation Area. This watershed is an “environmentally sensitive area,” because it contributes water to the habitat of an aquatic animal with increased vulnerability to human activities that could damage the environment.

The Bonne Femme CPA includes the watersheds of Little Bonne Femme Creek, upper and lower Bonne Femme Creek, Clear Creek, Gans Creek, Turkey Creek, Bass Creek, Smith Branch and Fox Hollow Branch. Five streams in this area have been identified by the Missouri Department of Natural Resources as “Outstanding State Resource Waters” (i.e., Devil’s Icebox Cave Branch, Bass Creek, Turkey Creek, Bonne Femme Creek and Gans Creek) and several endangered species (Indiana bat, gray bat, Topeka shiner, cherrystone snail and pink planaria) inhabit this watershed. This area is characterized by losing stream hydrology, caves, sinkholes, and springs. According to Boone County Stormwater Management, there are over 418 sinkholes of a depth of at least 20 ft. in Boone County, most of which are located near Pierpont and south of I-70 near Rocheport.

This area has been the target of several past efforts to conserve land, water, fish and wildlife. Most notably, the Bonne Femme Watershed Partnership was awarded a four-year grant from the Environmental Protection Agency in June of 2003, and they have done a great deal of hard work to identify the many unique and beautiful features of the watershed, and have documented serious factors affecting water quality and land use. Flooding, channel instability, excessive sediments, pesticides, nutrients, and fecal bacteria affect the health of humans and habitat used by fish and wildlife.

Agricultural cropland in the eastern area of the CPA (upper stream reaches) contribute to water quality issues and affected many of the at-risk species found in its streams. Row crop production and pasture and rangelands encompass 61.5% of the watershed with forested lands (distributed in a patchwork fashion over this landscape) making up the remainder of the area. The population of the watershed increased by 40% from 1990 to 2000, and development pressure from all aspects of urban expansion and ecologically unsound agricultural practices in the upper reaches of the watershed are anticipated to continue to increase in the near future.

The Steering Committee for the Bonne Femme Watershed Partnership (i.e., stakeholders) completed development of a scientifically based decision support tool, which eventually led to completion of the Bonne Femme Watershed Plan (February 2007). Several significant conclusions were identified in that plan that are still appropriate today, as follows:

- Streams in the upper reaches of agricultural areas are downcutting and eroding, leading to stream degradation in the watershed;

- Increasing development and increased runoff will continue to create undesirable conditions of the deeply-entrenched floodplain streams in the lower reaches of the watershed;
- More outreach is needed to assist residents in the watershed to manage their lands in this karst-dominated topography without adversely affecting karst hydrology;
- Northern Little Bonne Femme subwatershed is headcutting;
- Subwatersheds most vulnerable to degradation are clustered around Columbia and Ashland;
- All subwatersheds are considered “restorable,” with North Branch, Little Bonne Femme, Clear Creek, and Bass Creek subwatersheds being the most challenging;
- Regions within the watershed should be prioritized for protection and remediation, namely the urbanizing regions around Columbia and Ashland and the agricultural headwater region in the eastern portion of the watershed.

During the ONL collaboration, the natural legacy partners expressed a deep interest in continuing to implement voluntary programs with landowners (e.g., conservation easements and strategic fee title acquisitions) in this CPA. Incorporated as part of their initial conservation implementation vision were goals related to increasing urban tree cover, reforestation of riparian corridors, stabilization of problem areas in streams, promotion of karst topography best management practices, and many other related land management goals to improve water quality, wildlife habitat and forest health. Also, during stakeholder and technical committee meetings, the need to refine a list of resource protection goals for Devil’s Ice Box Cave and the Bonne Femme Conservation Opportunity Area was made clear.

i. Outreach

In the past, the Missouri Department of Conservation has made efforts to engage stakeholders in the Bonne Femme CPA, widespread public support was not strong, and stakeholder group actions for Bonne Femme COA were deemed marginally effective at best. Outreach efforts in the Bonne Femme CPA should be focused on reaching as many stakeholders as possible to again promote efforts to ensure the health of the waterway and the importance protecting the watershed for both ecological and human wellness reasons. Information costs to these efforts should be designed to be minimal and potentially offset – utilizing existing community groups where possible, and providing incentivization if feasible – in order to maximize engagement.

Additionally, highly localized volunteer programs should be explored, encouraging residents to help care for the stream in close proximity to their own land. This confers a dual benefit of both stream cleanup and a means for connecting residents more closely to the waterway near to where they live.

List of Recommended Actions

- Provide outreach about the watershed that minimizes information cost and incentivizes engagement, if feasible
- Coordinate localized volunteerism to increase connection with Bonne Femme Creek

ii. *Land Conservation*

Because the area around Three Creeks Conservation Area is a Missouri Department of Conservation Priority Area, MDC can leverage funds for land acquisition in the vicinity. Those funds should be applied to areas that maximize impact – the City of Columbia’s scoring matrix could be utilized here as well to identify projects that provide the most benefit. Ideally, projects that buffer both the Three Creeks Conservation Area and Bonne Femme Creek will receive top priority. Additional grant support for land conservation, as well as the utilization of private conservation measures like conservation easements, should also be explored to extend MDC funding as far as possible.

List of Recommended Actions

- Prioritize properties that buffer Bonne Femme Creek to provide maximum water quality benefit
- Utilize MDC funding for land acquisition in cooperation with other tools like easements and grant programs to maximize conservation impact
 - Promote connectivity of protected land using fee acquisition and non-ownership mechanisms (e.g., conservation easements)
- Promote karst topography best management practices and other related land management goals to improve water quality, wildlife habitat and forest health.
- Work with the U.S. Department of Agriculture and MDC’s Private Lands Division to encourage landowner participation in soil and water conservation programs on agricultural lands
- Redefine specific goals for protection of Devil’s Icebox Cave recharge zone

E. Cedar Creek Conservation Priority Area

Delineation of the Cedar Creek CPA was limited to an area of 91,709 acres in the lower watershed that is situated almost equally on portions of Boone County and Callaway County (the entire area of which is within Greenbelt's eight-county Area of Operations). Historically, oak woodland graded into oak and mixed-hardwood forests in the valleys with limestone and dolomite glades and woodlands occurring on exposed slopes (Nigh and Schroeder 2002). Today, many of the ridges and bottoms are cleared pasture with limited cropland or dense cedar-hardwood and old-field thickets and most of the glades are overgrown. Even though several stream habitat and water quality projects by the Missouri Department of Natural Resources and their partners have made impressive improvements to the water quality of Cedar Creek, and improved terrestrial wildlife habitats within portions of the watershed, there remains many opportunities to make additional improvements (e.g., streambank stabilization, native grassland community restoration).

Prior to 1940, the lands that comprise what is now the Cedar Creek Ranger District, Mark Twain National Forest (MTNF), USDA/Forest Service, were privately owned. During this time period strip mining, intensive cultivation and severe overgrazing led to soil erosion, depletion of the soil resource, and significant reduction in quality of the Cedar Creek watershed. Thousands of these acres, which had been exploited and abandoned, were known as "The Land That No One Wanted." The MTNF was given the responsibility to manage many tracts of land in this area in the early 1950s, and since that time, the Cedar Creek Ranger District and the Cedar Creek Grazing Association have worked cooperatively to improve the Cedar Creek watershed for recreation, wildlife habitat, and grazing. Early watershed improvement and soil stabilization efforts included seeding with tall fescue, planned grazing, and constructing erosion control structures.

MTNF lands (more than 16,000 acres) scattered throughout the Cedar Creek watershed form a patchwork quilt pattern and are interspersed with private landholdings. Lands in the steeper slopes along Cedar Creek and its tributaries are heavily-wooded with second growth hardwoods interspersed with fescue grasslands. Being the closest Forest Service lands to Columbia and Jefferson City, they are very popular destinations for hunters, bicyclists, hikers, horseback riders, campers, and many other outdoor recreational pursuits. The Cedar Creek Trail traverses 36 miles through the watershed, alternating between oak hickory forests and restored tall grass prairie patches.

Prior to 1977 and the passage of the Surface Mining Control and Reclamation Act, coal strip mining operations disturbed nearly 2,000 acres of the Cedar Creek watershed. Acid mine drainage (AMD), generated as runoff, drained over pyrite-rich soil exposed during the mining process, severely degraded water quality in the creek. Between 1948 and 1980, periodic discharges of AMD and acidic sediments into the creek resulted in numerous fish kills for years. In particular, the upper four miles of Cedar Creek continued to suffer from AMD and remained on the state's 303(d) list of impaired waters for many years due to high sulfates and low pH. However, by 1990, the Missouri Land Reclamation Program, Missouri Department of Natural Resources, had completed reclamation projects on 704 acres of land in the upper Cedar Creek watershed. The

reclamation projects re-vegetated and stabilized large areas of the Upper Cedar Creek watershed. Successful streambank restoration projects and the construction of passive treatment wetlands, resulted in Cedar Creek being removed from the state's 303(d) list and its waters now meets water quality standards for both pH and sulfates.

Unfortunately, flooding in the 1990s further contributed to AMD problems by damaging significant portions of streambanks that were not restored, causing additional acid-forming materials to be exposed and more sediment to enter the creek. After this damage, conditions began to improve again and data collected by the Missouri Land Reclamation Program (LRP) indicated that Cedar Creek once again began meeting water quality standards for both pH and sulfates. Dissolved oxygen concentrations also improved over time, and fewer occurrences of dissolved oxygen dropping below accepted standards occurred during 2001-2002. Alkalinity showed the greatest increase at sites downstream of the restoration site, suggesting that the constructed wetlands are neutralizing the acid seeps. Native trees and grasses are thriving, and wildlife are returning to the restoration site and downstream areas, largely as a result of the successful cooperative reclamation projects.

The Missouri LRP used section 319 funding in coordination with funding from the U.S. Office of Surface Mining, Abandoned Mine Land Clean Streams Initiative, to complete the cooperative reclamation project to address the remaining water quality problems at Cedar Creek. In 2001-2002, six passive treatment wetlands and alkaline-producing cells were constructed to treat AMD by adding alkalinity and removing dissolved metals and sulfates, and four acid ponds were amended and neutralized. Streambank restoration projects further added to the health and renewal of the creek. Project partners planted approximately 200,000 native trees and shrubs and helped repair 2,700 linear feet of eroding streambank at 16 restoration sites. Sixty-six acres were amended and seeded with native grasses for erosion control and wildlife habitat enhancement and additional native grass plantings were planned.

i. Outreach

Though the Cedar Creek CPA does not have the history of difficulty that outreach in the Bonne Femme Creek CPA has faced, the goals should be similar – provide as much knowledge as possible with minimal information cost and incentivization, and utilize localized volunteerism to care for and increase local connection with Cedar Creek.

List of Recommended Actions

- Provide outreach about the watershed that minimizes information cost and incentivizes engagement, if feasible
- Coordinate localized volunteerism to increase connection with Cedar Creek
- Promote karst topography best management practices and other related land management goals to improve water quality, wildlife habitat and forest health.

ii. Land Conservation

The Cedar Creek CPA is not a priority area under any mechanism save the ONL Plan, and so development of funding must be predicated on the use of donations, either outright or partial. Some grant programs allow for the use of partial donation – that is, sale of the land below market value – as a mechanism for providing match funds. Those options should be utilized judiciously.

Land conservation efforts in the area should prioritize properties that buffer Cedar Creek as closely as possible for maximum impact on water quality.

List of Recommended Actions

- Prioritize properties that buffer Cedar Creek to provide maximum water quality benefit
- Identify and prioritize properties with significant geologic features
- Utilize partial and outright donations to create match funds for conservation projects in the area
- Explore opportunities with public agencies and landowners to restore grassland habitats

F. Perche Creek Conservation Priority Area

The Perche Creek CPA is 103,256 acres in size and extends roughly in a north-south orientation. Only the immediate watersheds identified as “Perche Creek” were selected for this area, otherwise it would be a very huge area, much of which extends into areas in other counties that are not included in this project. The extreme southern limits of this area also overlap the western limits of the City of Columbia Priority Area. Existing parks (Strawn Park, community parks, regional parks) are found within this area as are park acquisition areas (tertiary targets) and planned trails (Perche Creek Trail, Harmony Trail). With the exception of working with the City of Columbia to accomplish development of planned parks and trails, there are currently no recommendations to pursue land conservation efforts in this area. There are no records of natural communities of conservation concern and few very records of at-risk species within this priority area.

i. Outreach

As with the Cedar Creek and Bonne Femme Creek CPAs, outreach efforts in the Perche Creek CPA should seek to minimize information cost and offer incentivization where possible, and to utilize localized volunteerism to care for and increase local connection with Perche Creek.

List of Recommended Actions

- Provide outreach about the watershed that minimizes information cost and incentivizes engagement, if feasible
- Coordinate localized volunteerism to increase connection with Perche Creek
- Promote karst topography best management practices and other related land management goals to improve water quality, wildlife habitat and forest health.

ii. Land Conservation

The Perche Creek CPA is facing heavy developmental pressure, as plats are being submitted for development currently. The City of Columbia is generally requesting 100-foot setbacks and trail easements as part of the platting process. As such, it is likely to be the first priority for both city expansion and the expansion of the Parks and Recreation Department’s trail development. Land conservation efforts should prioritize identifying valuable natural resources at risk from the developmental pressure, as well as projects that buffer both city trails and Perche Creek. Direct engagement in the process during the platting stage may provide an opportunity to accomplish these goals more readily. As with the Cedar Creek CPA, alternative funding measures and partial or outright donations should be utilized for projects in the Perche Creek CPA.

List of Recommended Actions

- Prioritize properties that are threatened with imminent development and buffer Perche Creek and the trail expansion
- Utilize partial and outright donations to create match funds for conservation projects in the area
- Identify significant natural features and communities for conservation

G. Hart Creek Conservation Priority Area

The Hart Creek CPA was not one of the original five priority areas identified during development of the ONL plan, but it was added for this project to ensure that the area between the Bonne Femme and Cedar Creek priority areas was covered during analyses. The headwaters of Hart Creek flow southwest, through the center of this priority area, toward the Missouri River, from near the southwest edge of Ashland; the small community of Hartsburg can also be found on the banks of Hart Creek. This 32,448-acre priority area is predominantly forested, although limestone glades, open woodlands, and old fields have been reported (primarily from Hart Creek CA). Steep cliffs are prevalent along the Katy Trail that runs through this area. The Hart Creek Conservation Area (657 acres) is a substantial area of public land in this smallest of all priority areas, which is 95% forested; information from the MDC Atlas Database makes up much of the information that is available about this entire priority area. The initial tract of Hart Creek CA was acquired in 1997 and MDC purchased an adjoining tract (83 acres) in 2000. The CA is reported as good for forest interior and spring migrant birds and has been designated an Important Bird Area by Audubon Missouri. A scenic view of the Missouri River is also available from an overlook deck. The MDC Hartsburg Access on the Missouri River separated from Hart Creek CA by a bottomland agricultural field. This priority area is small and the potential for conservation actions appear to be small, it will be included in all analyses in the event that conservation opportunities could be identified.

i. Outreach

As with the Perche Creek, Cedar Creek, and Bonne Femme Creek CPAs, outreach efforts in the Hart Creek CPA should seek to minimize information cost and offer incentivization where possible, and to utilize localized volunteerism to care for and increase local connection with Hart Creek.

List of Recommended Actions

- Provide outreach about the watershed that minimizes information cost and incentivizes engagement, if feasible
- Coordinate localized volunteerism to increase connection with Hart Creek

ii. Land Conservation

List of Recommended Actions

- Identify significant natural features and communities for conservation